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GAS JOURNAL

LIGHT ♦ HEAT ♦ POWER ♦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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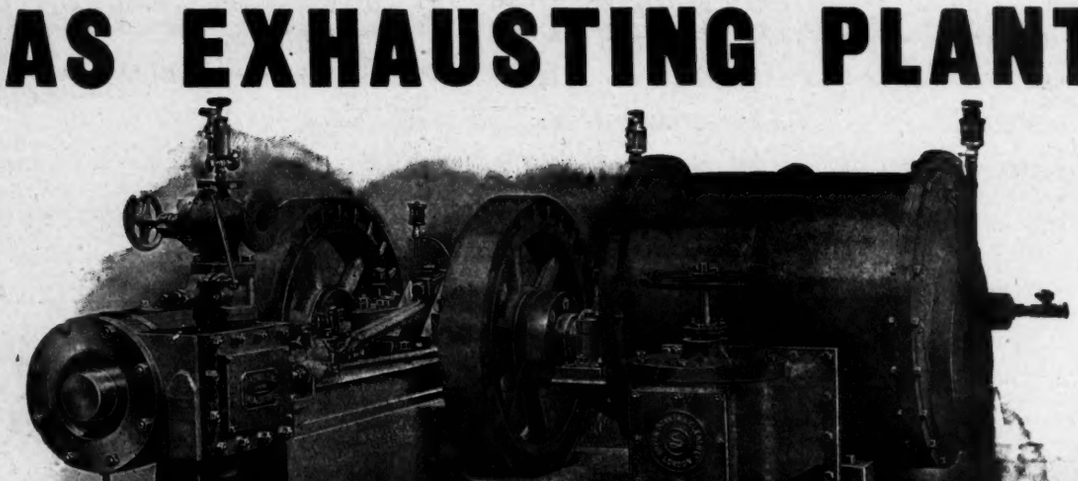

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EDITORIAL NOTES.

The Industry's Awakening to Opportunities.

To the reflective mind, last week's issue of the "JOURNAL" supplies suggestion for much occupation. It is found practically everywhere in its pages, but outstandingly so in the proceedings at the meetings of the National Gas Council, the Institution of Gas Engineers, and the Waverley Association. These all show that there is an awakened activity in the gas industry; that there is a looking-ahead; that great opportunities have been sighted; and that there is recognition that the duty of the industry, both to itself and to the country, is to advance in accordance with the requirements of the times, and not in accordance with the old inclination not to trouble about things outside the beaten track of the industry's technical practices and commercial doings. Indifference has had long reign. But, by persistent pegging-away on the part of friends of the industry, there has been a strengthening realization of the truth that, if the industry is not to be forced out of its rightful place and robbed of its opportunities for taking a larger share in the world's work, its men, and its richest-endowed men, must be up and considering the ways and means of progress. Other competing industries are exploring the best routes to take in the prosecution of their development; and their success—being competing industries—will naturally increase the difficulties of the gas industry. Development on their part in economical supply must therefore be met by development on our own part. It is all a matter of those engaged in the distribution of Nature's gifts putting them at the service of mankind in the most economical manner. Where the purposes of these gifts are similar, the industry that can render the best service at the lowest cost will be the industry that will gain the largest amount of business territory.

This is an obvious truism which can be made the starting-point in considering the question of how best to help to promote the capabilities of the industry. It is many years since the signs were given as to what was to be the destiny of the industry; but its destiny has never been marked with such definiteness as it has been during the war. The most extensive business of the industry will undoubtedly be in gas for heating, both domestic and industrial; it will continue to share the lighting and power business of the country with the electricity industry, though probably the proportional degree of the share in respect of lighting may change. Circumstances may tend, if producing economies allow, to a still larger participation in the power business; this depending upon the progress of the industry in meeting the demand for a cheaper supply of gas for power. The secondary products offer vast opportunities for expansion, to the advantage of the primary gas business. Distinct from its domestic gas business, the gas industry is destined, providing there is active prosecution of development, to be the source from which other industries will draw their supplies of materials, and much of their heat and power energy. Even the electric supply industry may become considerable patrons for coke and gas for heating and power; the war gives warrant for the expectation. Not one of the lines of possible development must be neglected. They are all essential to the ultimate economy through which must come the protection and progress of the gas industry.

As mentioned in previous articles, there is no prospect of any immediate advantage, at the end of the war, being derived from the costs of gas-works material being lower than those ruling before the war. For long to come higher costs will have to be faced. It may be argued that this condition also applies to the electricity industry. That is indisputable But the electricity industry is not such a large consumer of coal as the gas industry; and in fuel consumption it has a considerable field for economy. The improvement of the load factor produces economy, and so do modern generating plants. There are plants, given coal of normal ash content, now generating about 750 units per ton of coal; there are others that have not one-third of this efficiency. Between good and bad efficiencies, there is abundant scope for great economy. In addition, it has been proved that much can be done by linking-up, reorganization, and plant concentration; and Committees have been sitting, and a Departmental Committee is now sitting, with the one intention of ascertaining whether there are any other means of placing, or what are the best means to be taken to place, electrical energy at the disposal of users at lower prices. A Sub-Committee of the Government Reconstruction Committee have sent to the Board of Trade Electric Power Supply Committee evidence that has been received as to pithead generation, which includes the carbonization of coal for the production of gas and secondary products. Coal carbonization with the view to reducing the costs of generation is in strong favour in the electrical industry, even away from the centres. The war has set a lot of eyes peering over the wall into Naboth's vineyard; and covetous eyes they are. But in this matter the gas industry has an advantage in the profitable disposal of its gas; and the war has promoted its position in the matter of working-up its secondary products, while the markets are part of its organized state. Experience and possession are assets. One of the aims of industrial reconstruction is national economy; and national economy will not be served by everybody going in for coal carbonization, so utilizing more coal than is necessary, and probably making more of certain products than are economically requisite or prudent. Where there can be interaction between industries—such as the electrical industry drawing coke or gas for fuel from existing coal carbonizers, so as to have little waste capital and the realization of maximum economy by local concentration of the carbonizing and secondary product operations—it should be done. We can see possibilities here—Mr. E. W. L. Nicol draws attention to some of them in an article in this issue—for an alliance that would be infinitely better than the big consolidations of carbonizing and electricity generating plants and high voltage transmission, of which some people have visions.

The gas industry has to meet these tendencies; and this is one of the matters that will probably receive attention by the Special Committee appointed by the National Gas Council to consider problems as they affect the gas industry arising out of the Departmental Committee sitting to inquire into the provision of cheap electrical power, as well as out of the work of the Board of Fuel Research, and that of the Coal Conservation Committee. And closely concerned with the operations of the Special Committee of the National Gas Council is the investigation which Prof. Cobb and the Lighting, Heating, and Ventilation Committee of the Institution of Gas Engineers and Leeds University are taking in hand in relation to different grades of gas, with the view of throwing light on economical gas production and the character of gas most suitable for general distribution and use. This gas will not be one heavily adulterated with incombustibles; but the investigation will be carried on at gas-works where varying quantities of blue water gas can be tested with coal gas made under different carbonizing conditions. It is an inquiry the importance of which to the industry cannot be over-rated; and, when the right time comes, it will be interesting to know to whom its inception was due. This, as a matter of fact, is the leading investigation on the road to permanent economical

gas manufacture and the cheapening of town gas for all purposes. The word "permanent" is used designedly, as all over the country necessity and the desire for economy in both coal and oil are producing a daily growing experience which will have more than temporary value. "Misfortune "educates the intellect." With higher costs, processes must be made to yield their maximum economies. It may be that as a result of this inquiry, just as candles have given way to calories, so calories will have in due course to give way to composition (which may mean a strict limitation of incombustibles) so as to give consumers a gas of good flame temperature at a lower cost. We have to await developments. But no one with a scientific interest in gas is pinning himself down to calories as being the final measure of the most useful gas for consumers. At the Waverley Association meeting, too, centralization of production was spoken of as another means of economy, as with the facility of distribution at higher pressures, the range of gas supply from large central works has been promoted. Experience in many places has proved the advantage of this to consumers in the surrounding areas, and to the central undertakings themselves by the improvement of their "loads," as well as the lowering of costs per unit of production.

The advantage which the war has given to the gas industry in the matter of the utilization of coke for steam-raising is one which must be closely followed up after the war; and all the enlightenment as to the ease with which the gas industry can assist, through secondary products and in other ways, in meeting the requirements of important industries, and so subscribing to the making of the country more self-contained and independent of foreign aid than ever before, all come within the category of "opportunities," which must not be left to take care of themselves. The industry has awakened to its opportunities. As close observers of movements in the industry, and of movements in other industries which, for good or ill, may affect the interests of our own, we are glad to see this awakening. Developments must be made and firmly established; otherwise expansion and protection will both suffer. There is no time to be lost. Through every economic development that can be made, a greater consolidation of the position of the industry will be effected.

Uneconomy of Inert Material in Coal.

THERE has been much written and said lately regarding the adulteration of coal gas; but the author of a short article in this issue of the "JOURNAL," signing himself "A.S.H." (which letters, without the separating points, stand for an undesirable constituent of coal), considers that a question for the industry and the nation is the present supply of excessively adulterated gas coal. For the matter of that, the same applies to coal generally—steam and household, and from all coal areas without discrimination. The subject of the effect on gas production of the large amount of deleterious substance in gas coal has been commented upon in these columns on other occasions; but "A.S.H." deals with the matter in a way which shows that "false economy" is attached, from beginning to end, to the whole procedure of sending away from the collieries a large percentage of rubbish on any pretext whatsoever. The condition of coal in respect of inert material has been getting worse and worse during the war—the year 1916 was worse than 1915, and 1917 is worse than 1916; the coal owners having been rather encouraged by the sanction of uninformed authority to send out dirty coal. They have probably no great objection to being paid the price for coal under the terms of the Price of Coal (Limitation) Act, or any higher figure that finesse can obtain, for 15 to 20 p.ct. of rubbish, besides saving the expense of picking, and this under the palladium of a sympathetic Government Department. Before the Coal Controller came into office, the railway transit of coal was a difficulty which was ever-present with the Board of Trade. The coal owners urged that the loading of wagons was delayed by the screening of coal. Then said another department, with a blind eye to every side of the question except that of the coal owners: "We will ask people, for the good "and convenience of the country, and the speeding-up of "railway delivery, to accept 'unscreened coal.'" Some of the coal proprietors winked their eyes and rubbed their hands over the consideration shown them, and with stimulated energy went about the sale of a still higher percentage of inert substances.

"A. S. H." drops a few bombs into this trading position, and shows its uneconomy, in respect of railway traffic, in a startling manner, from which the Coal Controller and the Shipping Controller will see that they will both be assisted, as well as the country, by insisting on the proper cleaning of coal at the pits. Just think of this. Taking the 3 million tons of coal used per annum for the purpose of gas making in London, the presence of 16 to 17 p.ct. of inert material in this quantity (the percentage, of course, varies) means about ½ million tons of useless stuff that has to be conveyed from the North, occupying the holds of vessels or railway wagons. This rubbish would mean a journey for 250 steam-colliers, each with a carrying capacity of 2000 tons, or a single journey for 25,000 trucks each of 20 tons capacity. And this only refers to the gas-making coal of London! Then what an immense source of saving there is here if applied to the coal consumption of the country. Better the conveyance of good gas-producing and combustible material than the conveyance of rubbish. Women at the pithead can do the picking. The 16 p.ct. of incombustibles means not only the addition to that extent to the railway or other means of transport to the point of consumption, but the handling of that amount of useless material before conveyance and after. Taking gas-works alone. The delivery of the excess rubbish means that addition to the labour of handling, the reduction of storage, and the lessening of the capacity of the plant for carbonization, and which reduction is a dead-waste of capital. More money is spent in every direction per ton of good material; and there is less production per ton of coal and rubbish—less gas and liquid products (including the ingredients for explosives making), and the coke is of inferior quality for heating work. The very purpose for which a Government Department was advising consumers to accept uncleaned coal has been defeated. To facilitate the rapid despatch of wagons, useless material is sent out which takes up wagon room, which is more important than the labour involved in cleansing the coal. There is such a thing as being penny wise and pound foolish. There is such a thing as producing economy at one end of the railway lines and distributing uneconomy throughout the whole country. That is what this despatch of coal containing a heavy percentage of valueless material means. The Coal Controller wants to save railway carriage. Here is a grand opportunity. He is scheming to protect households and industries against fuel shortage during next winter. Every 1 p.ct. by which the incombustible material is reduced from coal is increasing by 1 p.ct. the sound combustible and products yielding coal distributed and put into store throughout the country. There is an unavoidable quantity of ash in different coals, but all useless substance beyond (and there is some rough stuff other than ash now being delivered to gas-works) is cumulative in promoting uneconomy and waste.

There is advocacy just now of mixing blue water gas with coal gas in order to economize coal; but the percentage by which this can be done has relation to the non-productive content of the coal. There is also a desire that, apart from the monetary aspect of the question, the quantity of oil used for carburetting water gas shall be reduced to the minimum. Here, again, the percentage of rubbish delivered with the coal has a bearing. The Coal Controller may perhaps consider this question not only in consultation with the coal producing experts, but with the coal consuming experts. It does not require any deep consideration to see that in these times we cannot, in the national economy, afford to carry about the country material that has no value.

Systematic Re-Organization in the Gas Industry.

OPINION is growing apace that the organization of the gas industry is still not all that it should be. What has happened in connection with the headquarters' scheme shows the existence of cross roads and independent action, instead of united travelling and mutual consultation. It has also revealed the existence of indurated judgments which have not been softened by the altered circumstances of the times. However, the results of the defects of our organization have assailed the industry's operations year by year; and though matters have been greatly improved by the formation of the National Gas Council, there is the settled conviction that the position is not wholly satisfactory. It is not a body that has cured the defects of certain existing organizations; it has left them just as they were. The Council was brought into existence by combined action of those bodies; and its only

revenue is a small sum subscribed annually in equal amount by them. It may, however, be said that the Council has proved, by its constitution, the existence of a power and influence which prior organization lacked, or of which (in the case of the British Commercial Gas Association through restriction of operations) it did not or could not make full use. It may perhaps be suggested that any defects in the existing organization would be gradually corrected when the National Council (which has done exceedingly good war work for the industry, and for which too much credit cannot be given) is able to exert and assert itself under normal conditions. Yet the prevalent impression is that there is still something wanting in the shape of a thoroughly representative body from which the National Council would take its being, and to which it would be responsible. While, however, this impression exists, it does not yet appear to be shaping itself to any definite end. There is discussion—discussion of a spasmodic kind. And there is also the renewed consideration of a headquarters scheme—a matter that is essentially subservient to the final settlement of the question of organization. It seems to us that what is now wanted is a properly "organized" attempt to come to some solution of the organization problem, and then let the headquarters scheme become, when organization has secured a firm foundation, one of the first items in its programme. If there is present in anyone's mind a suitable site, then surely the industry is sufficiently healthy, wealthy, and wise to become (if the site is really suitable) possessors of it through the National Gas Council. The first thing is to let the industry know precisely where it stands in the matter of organization.

In our "Correspondence" columns, there is a suggestive letter from Mr. Thomas Glover, of Edmonton; and another from a correspondent signing himself "Spectator." The former (who has obviously given a good deal of thought to this question of organization) speaks purely from the personal point of view, and not officially for, or as a member of, the Society of British Gas Industries; while the latter is a technical man unattached to any organization, and therefore has no partisan feeling in the matter. Now from these two independent and widely separated sources, we get the one view that the question of organization should be taken up in a statesmanlike, systematic, and impartial way. Mr. Glover's suggestion is that a "recent example might be "copied, and a 'convention' be set up—partly nominated and "partly elected by all interests—to discuss a constitution "for the great industry of gas and smokeless fuel, under an "independent chairman." "Spectator" suggests a specially constituted committee. Both are in favour of an independent element in the body to whom is delegated the important work of settling once and for all the question of a thoroughly efficient and operative chief organization for the combined interests of the gas industry. There is not the slightest use referring such a question to a body dominated by preconceived views and prejudices, and with a disposition on the part of some of the members to follow faithfully any particular chosen leader. It is as certain as anything can be that, until the question of organization is approached and dealt with in a proper and broad spirit, discontent will continue, and the interests of the gas industry will surely suffer. We see discontent everywhere. It has lately been found in the North of England and farther still across the Border; it has been seen in the Midlands as well as the Eastern Counties; there have been traces of it in Wales; in addresses and papers the matter has cropped up; in private conversations with administrators, engineers, and other officials, there has been the expressed feeling that the industry's organization must be placed on a proper and definite footing if it is to put to most effective use its innate strength in fighting for progress and legitimate protection against other strong interests. Why all this, and who can explain it on any other ground than that we have not the organization which is desirable?

We will not just now discuss Mr. Glover's suggested scheme of organization, as, like Mr. Broadberry (see his letter), we should prefer a good general discussion in our columns not only of the scheme traced in the Presidential Address to the Gas Institution, but any other ideas that are put forward; and it would be a great pity to stop the discussion by any early comment. All that we will say at the moment regarding Mr. Glover's scheme (to which he is not irrevocably committed in view of his suggestions as to a "convention") is that the central and supreme organization ought to be of the simplest possible structure, and not complicated by too much devolution and sectionizing. Our idea (intimated last week when discussing the address) is that the central organization should be a body the members of which have personal touch and influence in every quarter of the industry, so that every unit will be welded to the other units to make the whole, with every unit contributing in the way necessary to the carrying of the industry from peak to higher peak of useful service, and thereby continually be adding to its strength.

Home Rule in Gas Affairs for Scotland.

The Presidential Address of Mr. D. Keillor to the Waverley Gas Managers' Association, as reported last week, was composed of topics bearing upon current policy and work. Among other things, he referred to organization; and this gave Mr. J. W. Napier an opportunity to speak of the undercurrent of feeling that there should be rather more "home rule" across the Border in connection with national organization. This is an old feeling; it is one which was very much to the fore at the time when affiliation of the North British Association with the Institution of Gas Engineers was first broached. The "union-is-strength" party in Scottish gas circles then gained the day. They believe in unity now. But there does appear to be a fairly general view that the gas industry of Scotland does not get quite the amount of attention to which it is entitled, and that this could be changed not by a complete severance of the Scotch gas undertakings from the national organizations, but by the formation of a Scottish Gas Council to be operated in conjunction with the National Gas Council, and by a Scottish Gas Committee to work hand in hand with the British Commercial Gas Association. There could, so far as we at present see, be no great objection to a Scottish Gas Council, working in collaboration in respect of local topics with the National Gas Council; but there would be to a separate organization, as one of the chief reasons for the bringing into existence of the National Gas Council was that Government Departments were (to put it mildly) a little bit confused by the multiplex character of gas organization, and preferred to conduct negotiations with one body only. As to the suggestion of a Committee for Scotland to work with the British Commercial Gas Association, Mr. W. M. Mason was present at the Waverley meeting; and it seems from what he said that in the past, when the suggestion of a Scottish Committee came up, it met with disaster on financial grounds. Other than this, there does not appear any serious objection to the idea; and it may come to this, that such a Committee will have to be formed and be welcomed, or the Association may lose the Scottish support—at least, so we gather from Mr. Napier's remarks.

Co-Operative Tar Distilling.

There appear to be signs of a little uneasiness among tar distillers; and we rather fancy there are good grounds for it. They have never before troubled to approach the gas industry with a scheme ostensibly framed for mutual advantage—though, now that they have come forward with one, the weight of advantage, faithfully following precedent, is on the side of the distillers. It is perfectly certain that they would not have introduced even an unacceptable scheme of this sort unless they had some misgivings as to the future. They know that in the past there have been lean payments for tar, and many undertakings have acutely felt this leanness. They know, too, that new conditions have arisen in the gas industry—that many undertakings engage to-day in tar dehydration or first-stage distillation, and that they sell the treated ar locally for road purposes. They are also aware that more of the large undertakings are making inquiries for complete tar-distilling plants. They have knowledge of the discussions as to co-operative distillation; and they are cognizant, too, of the fact that, despite one-third purchasing restrictions, it is quite possible to form independent companies of gas shareholders to carry on tar distillation in a given area. There is a yearning now among some of the distillers (not all of them) to themselves become co-operators. But just as their prices have not always been those which the gas industry has considered fair, so their scheme does not commend itself. An alternative one has been suggested by the National Gas Council, which, however, if agreed to by the distillers, would not bind anyone who did not care to take it up. Up to the time of the National Council

meeting yesterday fortnight, the distillers had not expressed their intention of accepting it. This does not look promising; but it will have been seen that the matter is going to be taken further. The Committee dealing with the matter have been reinforced, and are asked to consider the question of an alternative scheme among tar producers where districts are suitable. It is a question of the most economical and paying procedure for each district. In some, as the Manchester Institution say [*ante*, p. 518], the best method will be for the larger gas undertakings to be the centres for distillation. But their suggestion does not provide for areas where only medium and small concerns can be grouped. There need not be any trouble whatever about financing a co-operative movement. It could be arranged as an independently capitalized concern.

The Wrecking of Four Gasholders.

The Ashton-under-Lyne Gas-Works and the Dukinfield Gas-Works across the valley have been crippled by the loss of the service of their gasholders, and have sustained other damage, through the explosion which took place last Wednesday afternoon at a small chemical and munition factory in the former town. Small as was the factory, the loss of life, the suffering, and the destruction of property were severe and heavy. But the occurrence gave the ignorance of the daily newspaper men regarding gas matters a fine opening for its display, and that ignoraunce was flashed over the telegraph wires, and had circulation throughout the Daily Press of the country. The two holders at Ashton, of course, "exploded;" and this was also the reported fate of the two holders at Dukinfield. There is no explanation in the newspaper reports of this phenomenon, and no theory is put forward to in any way account for it. Perhaps it is as well. Of course, what simply happened to the holders was the splitting of the holder plates and the forcing-down of some of the columns and girders by the concussive and recussive effects of the terrible explosion; the gas so liberated igniting, and burning itself out. The holders, it will be seen by the accounts published in other columns, are lying in crumpled and shapeless mass in their tanks, with the broken standards. Recussive effects have been mentioned. From the description of the after-conditions sent by a technical correspondent, it will be remarked that he is particularly struck by the fact that the columns of one of the Ashton holders collapsed on the side away from the line of the explosion wave. We sympathize sincerely with Mr. J. Townsley, the Engineer at Ashton, and Mr. W. Lindley, the Engineer at Dukinfield, in the great difficulty into which they have been suddenly plunged, and from which we hope they will satisfactorily emerge quicker than at the present time their most sanguine expectations allow them to hope for.

Gas-Works of Local Authorities.

Since referring three weeks ago to the working during the past financial year of certain gas undertakings owned by local authorities, figures relating to a number of other places have become available for reproduction in the pages of the "JOURNAL." In the main, the conclusion to which they lead is the same in the different cases—that the results are quite satisfactory, having regard to the adverse circumstances amid which they have been attained. Arbroath has felt the effects of the Summer Time Act and the lighting restrictions; and a reduction made in the price of gas a year ago has now to be added again, to meet the increased expenditure. The price is also to be higher in Birmingham, where consumption continues to go ahead, in a manner which calls for the immediate provision of further new carbonizing plant to provide for the increased output. There is a surplus of £26,650 to be paid over in aid of the rates. The Burton-upon-Trent gas undertaking is finding £5000 for the rates, which is the same as a year ago; the net profit being £11,780, compared with £14,825 the previous twelve months. There is a profit-sharing scheme in operation here, based on the net cost of gas per 1000 c.ft. sold. The output of gas decreased by 6½ p.ct. There has, with a gross surplus of £17,489, been a net loss of £3062 in connection with the Devonport gas undertaking of the Plymouth Corporation, and a consequent increase in price. This result is, of course, attributable to the higher cost of materials, together with war bonuses and allowances to employees. Satisfaction is expressed with the results of the working at Glastonbury, bearing in mind the troublous times—the balance carried to net revenue account being £2825 (as against £3151), or some £400 short of what is required to meet income-tax and loan charges. At Hinckley, an excellent statement of affairs was submitted; a net profit of £1830 being revealed, with the unaccounted-for gas standing at less than 2 p.ct.

More Working Results.

With the statement that at Leek there is a net profit on the past year's working of £527, as against £1217 twelve months ago, it is pointed out that the cost of all improvements and extensions has been met out of revenue account. There was some increase in the gas sold and accounted for. There is a trifling net loss at Morley, nearly all of which is accounted for by a falling off in revenue from sales of gas. At Nottingham, on the other hand, a sum of £30,000 is to be allocated to the relief of the rates. A decrease is shown of 65 million c.ft. in the gas sold; but this is much more than accounted for by the diminished requirements for public lighting purposes. There is an advance in the price of gas at Shipley, which is stated to have been rendered essential by the accounts for the past year. The income from sales of gas is substantially down; street lighting having greatly shrunk. The Council are also hard hit by the falling off of the consumption of one former very large customer. Having in mind the poorer classes, the Council transferred £1500 to the Gas Committee from the general rate, so as to avoid a still further rise in the price of gas. The net profit at Todmorden is £744, compared with £1596—a result which the Council agreed to be good, in view of the circumstances. It is evident that, in the case of Wigan, what has been lost on the illuminating side, through prevailing conditions, has been fairly well compensated for by gains in the direction of cooking and heating—a large number of cookers and fires having been installed during the year. The cost of installing these has to a large extent been, and as regards the remainder of the amount will be, met out of revenue. At present, only about 20 p.ct. of the consumers have fires or cookers installed on their premises, so that there is scope for further expansion on this side of the business. In all cases, of course, the accounts have been enormously influenced by the higher cost of materials and labour.

National Union of Works Chemists.—A meeting of works chemists of Sheffield and district has resolved on the establishment of an organization of chemists. The main point at issue was as to whether the organization should be independent of, or affiliated with, the Iron and Steel Trades Confederation. Eventually, the scope of the whole thing was widened by the decision to form a National Union of Works Chemists, open to chemists in all branches of industry. Officers and Committee were appointed; Mr. N. H. Bacon being made Organizing Secretary.

Coffee Roasting by Gas.—Uniformity is the all-important feature in roasting coffee, as slight variations of temperature affect the flavour. Gas has been used in specially-designed small roasters, the consumption being 80 c.ft. per 100 lbs. Attempts to convert existing coal-fired grates for gas have failed; the consumption of fuel being excessive and the product unsatisfactory. Writing to the "American Gas Engineering Journal," Mr. C. L. Read states that surface combustion has been successfully applied to a converted coal set, with the view of reducing the gas bill. The oven is cylindrical, to fit the revolving drum. The furnace is at the base, along the centre line. The products escape from two outlets at the top, fitted with dampers; and a burner of the impact type extends the whole length. There is a marked improvement in the quality of the roast, due to the large amount of radiant heat from the full-length refractory bed. With coal doubled in price, and gas costing 80 c. or less per 1000 c.ft., it is possible to approach coal in the matter of cost without considering the more even roast, saving in labour, and cleanliness.

Gas Incinerators and Crematoriums.—The use of gas in household garbage incinerators is stated by Mr. J. E. Bullard, in a communication to the "American Gas Engineering Journal," to be such a valuable line of business, that it should not be jeopardized by the installation of appliances that have not been proved to be capable of durable and satisfactory service. They must be strongly constructed, as the linings are exposed to the corrosive action of steam and to sudden wide variations of temperature. Entire absence of odour from the outlet-flue is also important. If these requirements are satisfactorily fulfilled, other matters can be left to themselves to a reasonable extent; but ease of cleaning, renewing grates, removing non-combustible matter that has found its way into the fire-box, and consumption of gas, are all items that will tell for or against extended use of the incinerator. There is also the necessity for enforcing the immediate destruction of dead bodies of domestic animals; and the most sanitary method is by cremation. One gas-furnace and set of burners will answer every purpose; and since a temperature of about 2000° Fahr. is required, burners of the blast type are usually found to be necessary. These are fields at present but little exploited, which offer opportunity for the gas industry.

PERSONAL.

The Town Council of Rothesay have given an honorarium of £200 to Mr. WILLIAM WHYTE, their Gas Manager, in recognition of his services as engineer for the extension of the gas-works, and the introduction of vertical retorts. This work is now satisfactorily completed.

Mr. ROBERT PORTER, who has been Secretary and Manager to the Elland-cum-Greetland Gas Company for a number of years past, and is Consulting Engineer to several gas undertakings, was married last Thursday, at Lytham Parish Church, to Mrs. Shaw, widow of Mr. J. T. Shaw, of Wombwell. The bride is a native of Elland.

Membership of the Legion of Honour has been conferred upon Captain PAUL NAUDE, the Manager of the Pau Gas-Works, who on the outbreak of war was mobilized as a Lieutenant of Artillery, and has now received the highest French decoration in recognition of his signal courage, energy, and spirit throughout the whole course of the campaign.

Having accepted an appointment with the Nobel's Explosives Company at Stevenston, Mr. MALCOLM LITTLEJOHN, of the Glasgow Corporation Lighting Department, is giving up the secretaryship of the Scottish Junior Gas Association (Western District). He will be succeeded as Hon. Secretary and Treasurer by Mr. JAMES JAMIESON, of the Dalmarnock Gas-Works, Glasgow.

Mr. JOHN WILSON, Chief Assistant Engineer and Manager to the Greenock Corporation Gas Department, has been unanimously appointed Engineer and Manager of the Motherwell and Carfin Gas-Works, under the Motherwell Corporation, at a salary of £450. Mr. Wilson, who is 32 years of age, is a son of Mr. Alexander Wilson, the Chief Engineer and General Manager of the Glasgow Corporation Gas Department, and received his early training under his father in that city. He then served five years in the shop and drawing office of Messrs. Clarkson and Beckitt, Engineers, of Glasgow. He acted as assistant in the Glasgow Corporation Electricity Department for some time, and for two-and-a-half years had charge of the gas and electricity works at Huelva, Spain. He was then appointed Assistant Engineer and Manager to the Falkirk Corporation Gas Department, which position he held for five-and-a-half years, when he went to Greenock in a similar capacity about eighteen months ago. He is an honours man of the City and Guilds of London Institute in "Gas Engineering" and "Gas Supply," and a member of the Scottish Junior Gas Association (Western District) since its inception, having been elected President for the session 1913-14.

OBITUARY.

Much sympathy will be felt with Mr. T. H. HAZELL, the Secretary of the Newport (Mon.) Gas Company, and President of the Newport Chamber of Commerce, in the great loss he has sustained by the death of his wife, which occurred recently, at their residence in Caerau Road. The funeral was largely attended; representatives of the Gas Company acting as bearers.

Mr. Thomas Glover's Remarks at the Institution Meeting.

By the accidental omission of the word "or" in one of the sentences in the remarks of Mr. Thomas Glover, of Norwich, at the recent meeting of the Institution of Gas Engineers, a somewhat misleading construction was placed upon his statement. Mr. Glover was referring to the appeal just made by the Coal Controller; and the sentence in question should have been reported as follows; "He [the Coal Controller] has not claimed to know much about blue water gas; but he is impressed by the figures I have been able to put before him as to the saving in coal which may be effected if the plants which are now standing idle, *or* are only used to the extent of 2, 3, or 5 p.ct. during the year, are brought into regular use, and the gas—whether blue, slightly carburetted, or carburetted to a greater extent—is added regularly to the coal gas, and the coal gas is kept moderately pure, and the accidental intrusion of other gaseous elements discouraged, then I think you can add quite a decent percentage of blue water gas with benefit to yourself, and certainly to the gratification and the satisfaction of the Coal Controller." The "or" which was omitted from the report as it originally appeared in the "JOURNAL," is printed in italics.

Mr. Stansfield Richardson, who died last March, and who was Chairman of the Sunderland Gas Company, left estate of the value of £198,269; the net personalty being £173,560.

According to the "Chemist and Druggist," copper sulphate is too precious in Germany to be used for making plant-sprays. In its place is being recommended a bye-product of gas manufacture known as "perocid."

Messrs. Newton, Chambers, & Co., Ltd., have invited the members of the Midland Section of the Coke-Oven Managers' Association to visit their Thorncliffe works, on the 30th inst., to inspect the new Semet-Solvay ovens under construction there, and afterwards the Rockingham Chemical Works at Birdwell.

ELECTRICITY SUPPLY MEMORANDA.

THERE is still a great deal of nervousness over the Board of Trade Electric Power Supply Committee. It has metaphorically been torn to shreds, it has been dissected, it has been analyzed, and, by every method of examination, it has been found wanting. But, though realizing this, there are people who try to extract a little hope from it, though they cannot conceal a certain amount of anxiety. Government interference from the first, our good friend the "Electrical Review" tells its readers, has been the bane of electricity supply. Of course, its readers have never heard this before, and have never come to a conclusion that such is the case. Our contemporary also prints the pious wish, which has universal existence in the electricity industry, that history may not repeat itself on this occasion, and that for once the intervention of a Government Department may not have a detrimental effect on the development of the industry. This depends on the meaning our friend gives to the words "detrimental effect." Following closely the plaints of the electricity industry, it seems to us that all protection of the public interests that stands in the way of the electricity industry doing precisely as it likes, whether right or wrong, is an "intervention" with a "detrimental effect" upon its development. It is one of the most selfish industries of which we know. It wants everything its own way, or everything is not right. But the "Review" in regard to the Board of Trade Committee steers a middle and non-committal course. It is encouraged by the fact that the Committee made such a profound start with its work as to publish a statement of the long-since moulded belief as to the inadequacy of the system, or the want of system, upon which there has been electrical development [see *ante*, pp. 373, 430]. This parrot-like performance is described as a "fortunate circumstance," which is no doubt due to the "powerful influence" exercised by the three or four electrical members of the Committee. We do not know whether this is a compliment or otherwise. If their "powerful influence" was necessary for such a commonplace piece of work, the future productions of the influence do not threaten to be of a very useful order.

The Board of Trade Committee.

Its Composition.

Our contemporary does not say anything very emphatic regarding the composition of the Committee. In one place, it does refer to the large proportion of non-technical men in the constitution, and suggests the names of two or three electricals who might be helpful as members. But if the present electrical members have already a powerful influence, why attempt to interfere with it in a manner which might only produce greater discord in the findings of the Committee? Of this, the electricity industry may be sure, that, whatever the recommendations, they will not be received with unanimous pleasure. However, it is hoped by the "Review" that a constructive policy on lines of common sense designed not to pander to the political aims of local authorities, nor to fill the pockets of speculators, but to serve the interests of the community as a whole may be speedily evolved. How is this to be obtained? The answer we suppose is intended to be discovered in the statement that what is required is not a verdict by a majority of representatives of sectional interests, but that of a Committee of impartial experts capable of appreciating the merits of the question, and free to arrive at an unfettered decision based thereon. Whence are the "impartial experts" to be obtained? We have been seeking for them everywhere—even among that immaculate body the Illuminating Engineering Society. But the impartial ones appear to have equal claim with the dodo to the distinction conferred by extinction. It would not, in view of its remark as to sectional interests, please the "Review" to have upon the Committee a preponderating municipal influence. But the local authorities are continuing their protestation. Some forty odd have avowed their belief that their interests are not properly safeguarded. But what are forty among so many who have not registered their discontent? [Since the foregoing was written, the President of the Board of Trade has stated in the House that he has decided to increase the representation on the Committee of local authorities owning electrical undertakings. We suppose the companies will now be dissatisfied.]

Castles in the Air.

Up to the present, and the prospects are not great, the electrical power companies who years ago staked-out large claims in this country within which to operate have not done much (some no) good for themselves financially. Their success seems to be at the minimum with a scattered industrial area and at the maximum in a relatively small concentrated industrial district as on the North-East Coast. But with fairly large-scale exponents of a miserable existence, there are persons who still think that pithead generation of electricity will work miracles. The cheaper current can only be supplied close to the point of generation; and it must become dearer, through the cost of distribution, the farther the point of delivery recedes from the place of generation. It is also, as a rule, difficult to get supplies of water near to coal-pits in sufficient quantities for large condensing purposes, without the construction of special water-supply works. The point is also frequently overlooked that, if the coal is first carbonized at the

pithead, the products have to be distributed about the country, so that there is not a great saving of conveyance costs in the long run, against which have to be placed the electricity distribution expenses, involving very considerable capital charges. Mr. Robert Fleming, of the Investment Trust Corporation, has recently been giving evidence on the subject before a Sub-Committee of the Reconstruction Committee; and he has been telling the shareholders of the Trust about his wonderful scheme. We do not know just what are Mr. Fleming's particular qualifications for instructing the Reconstruction Committee on this subject; but anyway his notions appear to be beautifully amorphous and vague. If "Electrical Industries" gives a fair idea of the lines of Mr. Fleming's advocacy and the expected results, then may the country be defended from "reconstruction" projects of such loose design. It might be found that "reconstruction" was synonymous with destruction. He proposes to link-up the whole country through central stations placed at the most convenient points and near coal, thereby providing the whole industrial country with power and light at minimum cost. How delightfully simple! and how original! The same thing has been heard of time and again, almost from the period of the passing of the first General Electric Lighting Act. But the visions and the ideals of sprightly imaginations have never yet materialized. The results are "expected." Some people have "great expectations" that end in the unhappiest disappointment. The ground on which the results are "expected," and confirmatory details, are not available in the reference before us. The first one is a saving in coal consumption reckoned at 50 million tons per annum, and consequently an equal increase in our available export tonnage. How this miracle is to be accomplished by turning the (say) 32,480,000 B.Th.U. of a ton of coal into electric units (on the high efficiency production scale of 3 lbs. of coal per unit of electricity generated) yielding 2,551,320 B.Th.U. is not explained. Then, secondly, we are to have an enormous saving in coal transportation, against which the cost of electrical distribution is not mentioned, nor is the cost of (if carbonization is proposed) conveying and disposing of the residual products. Under the scheme, wonderful developments are to be made in manufactures for export. Of course! It was always electrically said it would be so; therefore it must be. But we have a fancy for a little reservation.

Munitions and Power Supply.

The shortage of paper and its expense cause restrictions which deprive the technical world of part of its usual large supply of information, and this, just at a time when, through the unusual circumstances, there is extraordinary interest attaching to experiences. For example, there is remarkable growth of electric power supply in the busiest munition areas, the provision for meeting which will be let loose at the close of the war, just as will be the war developments of the gas industry in regard not only to gas but its other products. Through the severity of the paper conditions, the annual tables published with the "Electrician," giving data as to position and progress, will not be distributed free to the readers of our contemporary; but they are, we understand, being issued separately in volume form. In a notice in our contemporary, it is stated that there are now 581 entries of supply undertakings, against 564 last year—the additions being chiefly small stations, mainly supplied with energy by power companies. The growth in the maximum demand has been considerable in the case of some of the larger undertakings; and this shows how munitions have pressed the demand for power. At Sheffield, the maximum load in 1915 was 19,153 KW., and in 1916 35,999 KW.—a growth of nearly 90 p.ct. At Birmingham, the maximum load in 1915 was 36,717 KW., and in 1916 44,355 KW. "In other towns the increase has not been so marked." In Leicester, the maximum load in 1915 was 3874 KW., and in 1916 7874 KW. The same expansion is noticeable in the case of the power companies—more particularly in that of the Clyde Valley Electrical Power Company; their total connections in 1915 being 43,500 KW., and in 1916 69,830 KW. The growth of the Newcastle-on-Tyne Electric Supply Company has also been remarkable—the total connections being equal to 210,932 KW. These are examples of the concerns the owners of which are rubbing their hands in jubilation. Those in non-industrial areas wear rueful countenances, being constantly vexed with the base problem as to how to make ends meet.

For Repairs and Maintenance Only.

The electrical supply industry is a little happier than it was in connection with the manufacture and use of wires and cables of small size for interior work. There has been a modest relaxation of the restrictions under which supplies of insulated copper wire may be obtained without a priority certificate, provided that the would-be users are able to satisfy the manufacturers or suppliers that the goods are to be employed solely for the purposes of repairs or maintenance. The Cable Makers' Association have been granted permission to obtain monthly a limited supply of copper for distribution among manufacturers, whether or not they are members of the Association, for the purpose of producing insulated wires required for repairs or maintenance. The Association are held responsible for the distribution of the copper. There is a measure of happiness even over infinitesimal relaxations of stringent regulations; and this is a case in which there would be danger if there could not be rehabilitation of defective wiring.

A Nernst Vapour Lamp.

The title of "Nernst" in connection with electric lighting has not been much heard of lately; but it has now been attached to a vapour lamp, the efficiency of which is claimed to be as great as that of the high-pressure mercury vapour lamps. Prof. Nernst has taken out two German patents for lamps of the new type; and from these patents the "Electrician" gives a descriptive article. It explains that the "Nernst" lamp rests on phenomena which are observed when an arc passes between carbon electrodes in an atmosphere of zinc chloride or zinc bromide. These phenomena are analogous to those observed in the vapour of mercury and other metals. If the pressure of the zinc chloride vapour is too low, the light is dull; but at higher pressures—*e.g.*, at atmospheric pressure—the arc is sharp and bright. The lamp is provided with a spherical bulb, which contains two carbons. The upper electrode is connected to the iron core of a solenoid, which is suitably protected against the chemical effects of the vapour. The lower end of the spherical bulb terminates in a short closed tubular connection, which contains the salt to be vaporized. In the second patent Nernst describes a vapour lamp in which the main conducting medium is mercury vapour, with a suitable salt added to give a better colour to the light. The principle of the lamp consists in adding a line spectrum to that of the mercury vapour. In this way a white light is produced. Mercury vapour, however, has the property of continually removing any foreign substances. It is, therefore, possible to introduce a colouring substance continuously, if such substances are used as will fuse at the temperature of the mercury vapour lamp. The substances thus continuously volatilize with the mercury, subsequently condensing and flowing back into the circuit in order to begin a fresh cycle of operations. A specially suitable salt mixture is said to consist of 70 p.ct. zinc chloride, 15 p.ct. calcium chloride, 5 p.ct. thallium chloride, 5 p.ct. lithium chloride, and 5 p.ct. cæsium chloride. A lamp of this kind without a series resistance is said to give a light of 3000 Hefner units on 120 volts. It takes 4 amperes, which attributes to the lamp an efficiency of 0·16 watt per Hefner unit. We should like to be assured as to the 3000 Hefner units. According to the published figures, the miscalled "half-watt" lamp is not "in it" for efficiency. Of course, complicated vapour lamps of this kind are only useful for special purposes.

Strike the Feet.

A remarkable and useful statement of the recovery of an apparently dead man who had had an electric shock is published by Mr. W. P. Strickland, of the New York and Queen's Electric Light and Power Company. It should have the widest possible circulation. The information is taken from the "Electrician." The man, when about to erect primary wires, was apparently killed by accidentally touching a wire carrying current at 2300 volts. A lineman immediately took hold of the ankles of the limp body, lifted it until the whole weight rested on the neck, and let it fall. He then took a pair of connectors and hammered the soles of the injured man's feet without removing his shoes. Another lineman opened the man's mouth, pulled forward the swallowed tongue (which occurs in electric shock), and was about to begin the Schaefer prone method of resuscitation, when the man returned to life. He was removed to the hospital, and is now well, though suffering severely from his burns. Similar cases of recovery are mentioned in connection with the plan of striking the feet without removing the boots in case of electric shock.

FACTORIES AND WORKSHOPS REPORT.

Questions Affecting Female Employment.

BROUGHT within the narrowest possible compass is the report for 1916 of the Chief Inspector of Factories and Workshops, which on this occasion—through the absence owing to illness of Sir Arthur Whitelegge—bears the signature of Mr. H. M. Robinson, the Deputy Chief Inspector. What has been done during the twelve months has been principally special war work. In conjunction with the medical and other officials of the Ministry of Munitions, useful work has been carried out by Dr. Legge in connection with the risk of poisoning among "T.N.T." workers; the results being so satisfactory that the number of fatal cases has fallen steadily. With so much new plant being put up, a good deal of attention has been required to the question of securing the suitable fencing of machinery.

It is pointed out in the report that the Police, Factories, &c. (Miscellaneous Provisions), Act, 1916, contains two clauses which affect the work of the Factory Department. One carries into effect a recommendation made both by the Committee on Accidents in Factories and by the more recent Committee on Retrenchment in Public Expenditure with regard to the investigation of accidents by certifying surgeons. It is no longer necessary for the occupier of a factory or workshop to report accidents to the surgeon; and the latter is only called upon to investigate those cases which are referred to him by the District Inspector in pursuance of the instructions issued by the Secretary of State under the Act. The other clause empowers the Secretary of State to require by order in any factory or workshop, or in any class of factories or workshops, certain "welfare" provisions for the well-being of the workers. The latter question has, of course, been brought into prominence by the great increase in the number of

women employed; and although in many large munition works excellent provision has been made for the health, comfort, and social welfare of the employees, it is felt that the need is not less great in other classes of industry.

The report remarks that it is fairly well recognized now that continuous and excessive overtime very soon produces lassitude and slackness among workers, and injuriously affects efficiency and both the quality and quantity of work. On the other hand, a moderate amount of overtime, judiciously arranged, has given satisfactory results.

In a report which is appended, Miss A. M. Anderson, the Principal Lady Inspector of Factories, deals at length with the effect of the third year of war on industrial employment of women and girls. As the result of the large amount of experience that has been gained, she says it appears that the one absolute limit to the replacement of men by women lies in those heavy occupations and processes where adaptation of plant or appliances cannot be effected so as to bring them within the compass even of selected women of physical capacity above the normal. But the outcome of careful selection is very surprising, even in fairly heavy work, among other places, in iron and tube works, chemical works, gas-works, and stacking of coal.

Miss Anderson remarks: "If they stick this, they will stick anything," a manager is reported as saying of the grit and pluck of the women in a gas-works in the recent severe weather. It is permissible to wonder whether some of the surprise and admiration freely expressed in many quarters over new proofs of women's physical capacity and endurance is not in part attributable to lack of knowledge or appreciation of the very heavy and strenuous nature of much of normal pre-war work for women, domestic and industrial." Referring specially to the heavy work in gas-works, one of the lady inspectors says: "In no case has there been any complaint of the effect on their health. On the contrary, it is our invariable experience in all outdoor labouring to find health and appetite greatly improved by work in the open air. It is evident that special clothing must be provided, as well as lighter shovels and barrows."

The experience seems to be that in the country generally, apart from a few localities, the supply of women is almost unlimited; and Miss Anderson says the national gain appears to her to be overwhelming, as against all risks of loss or disturbance, in the new self-confidence engendered in women by the very considerable proportion of cases in which they are efficiently doing men's work at men's rates of pay. The report concludes with a section on the development of conditions of welfare.

THE ADULTERATION OF GAS COAL.

By A. S. H.

LONDON alone is now receiving at the rate of about half-a-million extra tons yearly of inert material in its seaborne North Country gas coals, as compared with pre-war supplies. If one imagines a chain of 250 steam-colliers of 2000 tons each entirely loaded with belt pickings, it will give a quantitative idea of the present adulteration per annum of London's seaborne gas coal, and show that here is a matter that is worthy the notice of the Shipping Controller, as well as that of the Coal Controller. But the Londoner must take up the cudgels in the first instance. Perhaps he does not realize that there is a difference in the gas-producing quality of the coal, on an average, of about 16 p.ct. less than in 1914 for the approximately 3 million tons he uses for gas making per annum. This depreciation of the quality of the coal has been a progressive one. Although there was a drop in the quality both in 1915 and 1916, yet it was nothing like the drop in 1917.

Now, what applies to London seaborne coals, in all likelihood applies to the whole country, in so far as North Country coals are concerned. As to Yorkshire and other varieties, those who use them must fight their own battles. Anyway, the matter is a serious one, and must be quickly grappled. There is no economy in mixing rubbish with coal. It is exactly the reverse, from whatever point of view it is looked at. We are told, for example, there is a great shortage of railway wagons, ships, barges, &c. Can there be any sense in taking up 16 p.ct. of their space by badly selected coal? The cleansing of coal is mainly performed by female labour. Surely it is to the interest of the Government to see that enough labour is expended on the cleansing of coal, in order that many times over labour shall be saved throughout the country and abroad—in handling, in colliery wagons, at tips, in haulage, at goods stations, in unloading vessels, barges, &c., all of which is generally performed by male labour.

Coal is now being stored for winter use; and if the poor quality continues to be stored, it may put several gas undertakings in dire distress in mid-winter, especially where plant of all kinds is barely sufficient to meet the increased demand, even if good coal is carbonized. Moreover, many works will be using uncarburetted water gas, which would in the ordinary course enforce a smaller make per ton, in order that the mixed gases may be satisfactorily burned. But the present quality of coals has already enforced a lower gas production per ton, and several works may be compelled to buy expensive oil to enrich the water gas in mid-winter. Yet they have been expressly asked to avoid further purchases of oil.

There is hardly need to remind gas engineers that, with poor quality coals, all things suffer. Besides reduced gas production per ton, there are less residuals, bad coke and breeze for sale and for the retort furnaces, more ash and clinker to get rid of, and, what is of still greater importance, less extraction of explosive materials for the Government.

HOLIDAYS.

By A. CANNING WILLIAMS.

DURING the past three years, head officials of gas undertakings have been subjected to a progressive pressure which has, in some cases, resulted in a condition bordering upon nervous collapse, and in many more has brought about a state of strain which, if not relieved, may lead to serious trouble. It is safe to say that there is scarcely a responsible officer in the gas industry (the remark applies, of course, to a very large number of other industries as well) whose life has not been shortened by the anxieties which the war has entailed, and who does not show in greying hair and lined countenance their physical effects. Such men have done more than their "bit;" and when the war, which still drags its slow length along, comes at last to an end, they need have no compunctions of conscience as to the part they took in sustaining the national burden.

During these years, as first one and then another loyal and trusted assistant left to join the Colours, the heads have taken upon themselves additional duties. They have felt it necessary to guide and closely superintend their largely inexperienced staffs; and so great things and little have claimed their attention and have exhausted their energies. Sleeplessness, with its natural sequel—irritability—has had its victims; and many who used to regard the trials of official life with equanimity are upset by trifles.

Among these worthy and over-taxed men, there are some who may be debating with themselves as to whether or not they should take a few weeks' respite from their labours, and forget (on the sea-shore, the golf-links, the moors, or the mountains) the cares that infest their working days, and find renewed health in the sunshine and the breezes. Some may be disinclined to break-away from business, on the score that they cannot be spared, or that there is no one with all the threads in his fingers whom they can leave in charge. Away with the thought! No man is indispensable. Death proves that often enough. A summer or autumn holiday to men engaged in high-pressure intellectual work is as much a necessity as food and sleep and air. Better a month from business than six months in a nursing home. Better a few mistakes on the part of the deputy than the great mistake of a breakdown on the part of the chief. So make your arrangements and, when you arrive at your holiday destination, "take it easy" for the first week, until tired mind and body have regained tone and elasticity. Do not spur yourself to effort. The healthy desire for activity will come if you but give Nature time. "I do not much believe in a man, however responsible his position, who never leaves his work," said the Chancellor of the Exchequer in his Budget speech a few weeks ago. And on another occasion he quoted the words of Burke: "The man who is always working can never have a sound judgment; he never gives himself time to cool." Mark Twain, whose philosophy was often as good as his humour, gave expression to sound wisdom when he said: "We bestow thoughtful care upon inanimate objects, but none upon ourselves. What a robust people, what a nation of thinkers we might be, if we would only lay ourselves on the shelf occasionally and renew our edges!"

If your holiday is to do you good, do not leave instructions for reports and important letters to be forwarded to you. You must side-track your brain, or, to put it another way, you must leave your official brain behind you in your desk, as R. L. Stevenson left his heart when he went canoeing on his "Inland Voyage." "I have paid all this money, look you," he writes, "and paddled all these strokes, for no other purpose than to be abroad; and yet you keep me at home with your perpetual communications. You tug the string, and I feel that I am a tethered bird. . . . There is no discharge in the war of life, I am well aware, but shall there not be so much as a week's furlough?"

Do not fetter your freedom, and do not imagine, as you lie on your back in the sun, or whip the stream with your rod, or ply the rhythmic oar on river or lake, that you are idling away the time. You are simply drinking draughts of vitality from the fountain-head, and fitting yourself to return to the daily round and common task with a clearer mind and—a sweeter temper!

"Field's Analysis" for 1916.

Though it has been found necessary to raise the price from 17s. 6d. to 21s., that it is still cheap, bearing in mind the information it contains, will be the general verdict regarding "Field's Analysis" for 1916, a copy of which has just been forwarded by the Compiler—Mr. Herbert Edward Ibbs, the Accountant to the Gas Light and Coke Company. Such full comparisons as are contained in the analysis of the accounts of the principal gas undertakings in England, Scotland, and Ireland, if they are wanted, are as a rule wanted badly, and must thus be very well worth the guinea that is asked for them. This fact is well understood by managers, consulting engineers, and others interested in gas supply undertakings, who have had the statistics (originally compiled and arranged by the late Mr. John Field) placed at their disposal now for close upon half-a-century.

WAR CONDITIONS AND GAS COSTS.

In a paper read before the New Jersey State Gas Association, the effects of war from an economic point of view, and especially in relation to the costs incidental to the manufacture and distribution of illuminating gas, were considered by Mr. Charles W. Hoy, the General Manager of the State Gas Company at Glassborough (N.J.).

He pointed out that the large exports reduced home supplies, and had brought about tremendous building and constructive operations, with the result that labour of all kinds was not only very expensive, but hard to get at any price. The high cost of living was a persistent and unpleasant factor. While at ordinary times there was a natural upward tendency in the cost of coal, a condition had been brought about that was not only without precedent, but likely to be maintained for some time after the close of the war. It did not seem likely that prices would ever be the same as formerly. The utilization of petroleum as a marine fuel, for the production of light motor-oils, and other purposes where price was not a controlling factor, had caused gas oils to rise heavily. Thus the use of gas oil as other than a reserve or an enricher for retort or oven gas, became a serious problem, affecting the selling price. Not only had the cost of the staple materials risen, but that of almost every material required for the maintenance of the plant had gone up 50 to 200 p.ct.; and the cost of putting gas into the holder had, to say the least, followed the lower limit. In addition to the depletion of labour by enlistment, there was the large demand for unskilled labour at exorbitant wages in connection with munition work. Against this, there were continuous demands from the working men for shorter hours. It was little use to calculate the cost of labour on the price of gas, because it was advancing from day to day.

Manufacturers could meet changing conditions by adjusting selling rates; but the price of gas was fixed by Public Utility Commissions. Some measure of relief on the high cost of production must be arrived at, or the selling price must be raised. A temporary increase might be allowed without resort to the usual inquiry, the calorific requirement might be reduced, and a patriotic resolve made, on the part of the gas undertakings, to shoulder as much of the burden as circumstances would permit. A reduction of the calorific standard from 600 to 550 B.Th.U., as already favoured by the Illinois State Commission, would save at least half-a-gallon of oil per 1000 c.ft. of gas, and allow more variety in the selection of coal. At present, only the highest grades would meet the case, where straight coal gas was supplied. Experts had shown that, with the lower limit, a larger heat value could be obtained per ton of coal, and in practice a higher duty was noticeable in atmospheric burners of all kinds. There would be no deposition of hydrocarbons in winter, and re-absorption in summer, which in some districts was so marked as to necessitate frequent adjustment of burners, and to cause carbonization and failure of mantles. It would tend to the uniformity of composition that was now admitted to be all-important, and go a great way towards meeting the increased cost of production.

Speaking on the paper, Mr. R. T. Pierce said that 600 B.Th.U. gas need not necessarily contain condensable hydrocarbons. In the event of extensive military operations, all gas-works might be required to instal benzol extraction apparatus; and he recommended the fullest publicity as to the dependence of Government on the gas industry for high explosive material. Employees should be exempted from active service, in order that the full make of gas might be maintained. Mr. Bunker said that a 625 B.Th.U. gas would be reduced to 600 B.Th.U., if carried some miles; but the removal of all condensable hydrocarbons would impoverish the gas too much.

PURIFYING MATERIAL FOUND IN GAS-METERS.

An interesting item in the report of the Committee on "The Life of Gas-Meters"—*ante*, p. 504—is the discovery of a brown solid in the inlet and valve chambers of gas-meters, containing a larger quantity of ferric oxide than could be accounted for by the corrosion of adjacent metallic parts, together with sulphide, cyanides, and free sulphur. Rust might be carried from the interior of mains and services, and minute traces of other constituents may be removed from the gas. But the presence of free sulphur in appreciable quantity can only be accounted for by the assumption that minute particles of oxide are carried forward from the purifiers by the current of gas. In one instance, 170 grammes (over 6 oz.) was found in a 2-light wet meter; while the cast-iron case and the drum were in excellent condition. So far as the evidence in the report goes, the phenomenon is due to some exceptional circumstances, and is not to be accepted as a regular occurrence. But the isolated examples quoted furnish an indication of a possible unsuspected trouble in connection with high-pressure distribution, which is becoming more general since the extended introduction of industrial appliances, and the more stringent pressure regulations imposed with the adoption of the calorific standard.

Many gas engineers are not unnaturally disposed to dispute the possibility of fine dust being carried forward from the purifiers, through the meter, gasholder connections, holders, and governors, mains and services, to the consumers' meters. They expect that the first indication of anything of the sort would be in the meter itself, and point out that the period of quiescence in the holder is sufficient to ensure the deposition of even the finest solid matter, and that this is antecedent and independent of any degree of compression to which the gas may be subjected in the course of distribution. These may be referred to corroborative evidence just to hand from the United States.

At a recent meeting of the Pennsylvania Gas Association, Mr. Chas. Wilde, the Engineer of Mains of the Philadelphia Suburban Gas and Electric Company, Chester, Pa., read a paper on recent developments in high-pressure gas distribution, dealing with the welded joint and the procedure necessary in order to secure good work, proper installation of district valves, and the solid deposits and means of prevention. He referred to the maintenance of valves and the prevention of deposits as two serious problems that yet await successful solution. A valve that has proved absolutely satisfactory under test is often found quite useless on the first occasion of operating. The gate may be damaged by the scouring action of scale in the pipe, carried forward with the first rush when the valve is opened; or solid deposit may accumulate in the pocket, preventing proper seating when it is required to close the valve. Every possible precaution should be observed to keep the pipes quite clean. A tight-fitting swab should be passed through in the first place, and drilling for services should be avoided until after the main is in use. A blow-off from the bottom of the valve should be provided, to admit of periodical clearing of the pocket, and a bye-pass from the inlet to the outlet to admit of the pressure being equalized on each side, before opening the valve.

These points are only mentioned in passing, as furnishing some clue to the origin of the deposits examined by Dr. Lessing; but interest centres round the deposits said to be general in high-pressure mains, particularly after some years' service, which are so deleterious to the valves and regulators. A sample of solid deposit and of drip oil was submitted to the Chemical Service Laboratories, Philadelphia, and a report, signed by the President (Mr. C. C. Tutweiler), indicates that the liquid is very similar to the deposit invariably obtained when illuminating gas is compressed. It was found that 51 p.ct. distils over below 120° C., and 91·75 p.ct. at 200°. The chief constituent of the solid is ferric oxide, but cyanides, together with ferric sulphide and sulphate, are also present; and it is not clear whether the source is the oxide purifiers or the result of reactions of traces of impurities in the gas, with the rust, &c., in the pipe. Dust catchers suitable for fixing on the line of main or at the inlet of a pressure regulator were described; the simplest form being a chamber similar to an ordinary drip-box, carrying a wire screen of fifty meshes to the inch, set at an angle of 45° towards the inlet, and having a collecting chamber and blow-off at the bottom. They can be fitted with a bye-pass arrangement of the usual character, to admit of cleaning or changing the screen without stopping the gas supply. The author used coke-oven gas and carburetted water gas; and the former gave the most trouble from dust.

In the ensuing discussion, the deposit was treated as a general experience, and ascribed to fine dust from the purifiers. It transpired that pressures up to 40 lbs. per square inch were not unusual, and for the most part the trouble was confined to within two miles of the gas-works—some said half-a-mile. In one instance, rust from a freshly-laid main that had been corroded by extended exposure to weather was carried forward to the burners, although no trouble was experienced on the works side of the extension.

A comparison of the American and English deposit is given:

	American.	English.
CS_2 extract (S with very little tarry matter)	—	20·62
S.	1·14	—
Ferric sulphide and sulphate	3·47	—
Cyanides, in terms of Na, Fe, $Cy_6 + 10H_2O$.	—	3·89
Ferric and ammonium ferrocyanides	25·76	—
Ferric oxide	57 94	40·44
Loss on ignition	—	21·29
Loss on drying at 105 C.	12·16	—
	100·47	86·24

The Calorific Standard.—An Order under the Gas (Standard of Calorific Power) Act, 1916, has been issued by the Local Government Board for the Rawmarsh Urban District Council. It is on the lines of similar Orders recently made by them.

National Insurance (Unemployment) Acts.—The Umpire has decided that contributions are payable under the National Insurance (Part II.) (Munition Workers) Act, 1916, in respect of workmen engaged in repairing in workshops automatic gas-controllers, and in respect of workmen engaged in making or repairing hand tools used in connection with charging or drawing gas-retorts.

Carburetted Water Gas and Toluol.—Speaking at the meeting of the Pennsylvania Gas Association, Mr. W. H. Cartley took exception to the statement that the only source of benzol and toluol was the bye-products of the distillation of bituminous coal. Carburetted water gas, he said, constituted 75 p.ct. of the total gas production in the United States. A 20-c.p. water gas contained more toluol than a 16-c.p. coal gas; and about one-tenth of a gallon could be extracted from a 22-c.p. water gas by simple oil-washing and subsequent rectification to purify the product. The light oil recovered by oil-washing contained benzol, toluol, xylol, naphthalene, and naphthalene oils, which could be separated by fractional distillation. The lighter parts might be returned to the gas; but the heavier constituents were not very useful for enrichment, being very readily condensed and deposited in the liquid form. The general adoption of the calorific standard was favourable to the extraction of the light oils, as, though the removal considerably reduced the candle power, it did not materially affect the heating value.

NEW GAS-WORKS FOR BARROW-IN-FURNESS.

BARROW-IN-FURNESS, described fifty years ago by the Right Hon. W. E. Gladstone as "the youngest child of England's enterprise," celebrated last Wednesday the jubilee of its incorporation. With this important civic event was linked the jubilee of the negotiations to purchase the gas and water undertaking from a private Company; and it was further celebrated by the official opening, by Alderman J. H. Neal, J.P. (the Chairman of the Gas and Water Committee), of new branch gas-works in the Salthouse district, which have been erected during the war at considerable trouble and with difficulty in obtaining material and retaining labour. The opening function was preceded by an inspection by members of the Town Council and officials of the old or central works in Hindpool Road; and this afforded those interested an opportunity of contrasting old and new methods in gas manufacture. It proved a very striking contrast; and especially at the new works was the absence of smoke and dust most noticeable. Mr. Fred Chadderton (the Corporation Gas Engineer and Manager), Mr. J. R. Bradshaw, B.Sc. (the Assistant Manager), and Mr. Wilfred M. Gabbatt (the Junior Assistant Manager), who is to take up residence at the new works, explained everything to the visitors, as did representatives of the various contractors for buildings, plant, and machinery.

HISTORY OF THE BARROW GAS SUPPLY.

The history of the manufacture of gas in Barrow shows that the gas undertaking was started in 1861, when the Barrow Gas Company, Ltd., was promoted. A plot of land adjoining Hindpool Road was purchased, and the first gas-making plant erected thereon. In 1863, the Company was merged into the Barrow Gas and Water Company, Ltd., with a nominal capital of £20,000. This Company on Jan. 6, 1865 conveyed the undertaking to the Furness Gas and Water Company, Ltd.,; and on Dec. 16, 1867, at a meeting of representatives of the Corporation, it was decided to recommend the purchase of the gas and water works by the town. Ultimately, the transfer to the ratepayers was completed, and the purchase price of £111,888 paid.

The estimate upon which the purchase was based gave the output of gas at about 20 million c.ft, per annum; the price 6s. per 1000 c.ft.; and the income £5500. The property was quite a prosperous one. The shareholders were in receipt of good dividends; and when the Corporation took over the concern, a premium of 50 p.ct. was paid upon each holding. No sooner had the transaction been compieted, than it became necessary to purchase some 5000 sq. yards of additional land, and make further extensions to cope with the rapidly increasing demands for lighting purposes. In 1878, more storage was needed; and a large plot of land was purchased at the corner of Ainslie Street and Devonshire Road, upon which a third gasholder was erected, in addition to the two already existing in Hindpool Road. Suitable plant was put down in 1891 for dealing with the ammonia extracted from the gas; and since that time sulphate of ammonia has been manufactured.

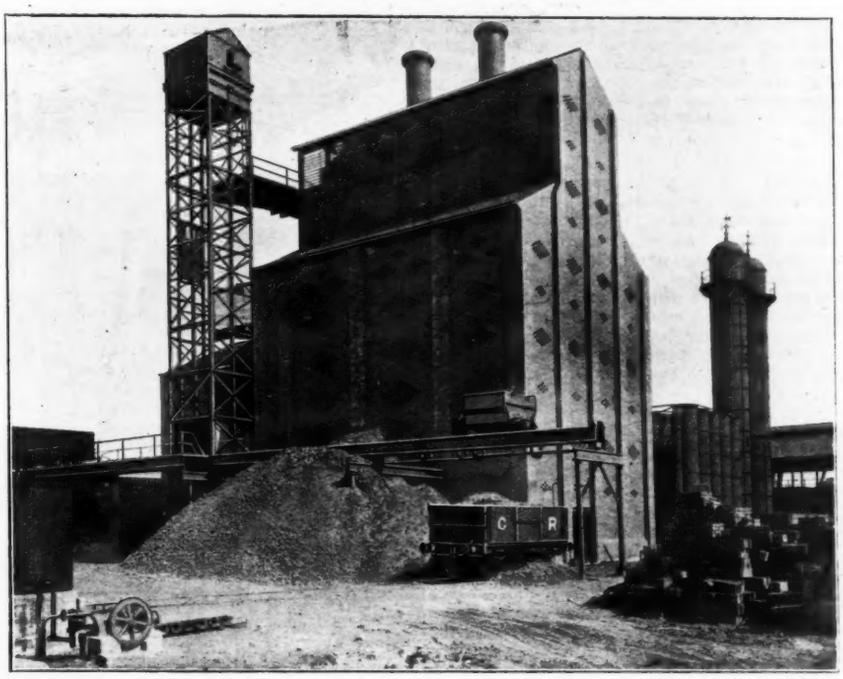
The works continued to progress; and in 1899 and 1905 still further land was acquired. Meantime, the coal-gas manufacturing and purifying plants had been extended to deal with 1,250,000 c.ft. per day, and the holder capacity increased. A carburetted water-gas plant of a capacity of 300,000 c.ft. per day was installed in 1903; and in 1910 a further similar plant, which can be worked when the former is undergoing repairs, was put down to produce 500,000 c.ft. per day. Cookers were first hired-out in 1885, and the first prepayment meters installed in 1895.

At the present time, 13,000 consumers are connected to the mains. Last year approximately 400,000,000 c.ft. of gas was made, 26,000 tons of coal carbonized, and 1300 tons of oil used. A sum of £57,000 was received for the sale of gas, and £15,600 for residual products.

THE NEW WORKS.

Owing to the continued demands for more gas, and the congested condition of the Hindpool Road works, the Council decided in 1910 that additional works must be erected. It was not, however, until 1913 that a scheme was finally approved. Various suggestions as to sites were considered; and ultimately the Salthouse position was adopted, and the land provisionally purchased from the Furness Railway Company. On Jan. 21, 1914, a Local Government Board inquiry was held at the Town Hall with a view to obtaining the necessary powers to borrow money for the work; and in January, 1915, the works were commenced.

The site upon which the new works have been erected comprises 7½ acres; and it was selected as being remote from dwelling-houses and nearer to the growing portion of the town than any other one obtainable. It was, also, extremely suitable from the point of view of level, being only about 17 ft. above Ordnance datum. There was one drawback, however, to the site—the very soft nature of the subsoil; it being composed almost entirely of silt, and in some places running sand. The design of the foundations for the various plants, therefore, required exceedingly careful consideration; and very special construction was necessary. The principle adopted was to form reinforced concrete rafts, which spread the weight of the superincumbent structure over the subsoil in such a way that not more than 1¼ tons weight per square foot was carried by the subsoil.



THE DEMPSTER-TOOGOOD CONTINUOUS VERTICAL RETORT HOUSE AT BARROW-IN-FURNESS.

The new works have been constructed upon the latest principles of gas making, and are at the present time designed for an output of 500,000 c.ft. of gas per day. Arrangements have been made so that they can easily be extended to 3,000,000 c.ft. output per day. There is a foreman's dwelling-house; and for the administrative portion of the works there are offices and stores, two storeys in height, including a cart weighbridge office. A workshop, with lavatory and bath accommodation, is provided near the retort-house.

The chief feature of the works is the vertical retort installation, for which Messrs. R. Dempster and Sons, of Elland, were the contractors. Combined with the retort-house is the broken coal store, also erected by Messrs. Dempster and Sons. The coal delivered from the high-level siding passes through a breaker, and is then elevated by gravity bucket conveyor, and, when not required in the retort-house, is tipped into this store, which will contain 600 tons. Extending from the latter is the unbroken coal-store, in which it is proposed to stock coal to be used in cases of emergency. A portland cement concrete retaining wall was first of all constructed to hold-up the embankment. From this a reinforced concrete roof has been extended; and the coal-wagons will run over same—the coal being deposited through trap-doors into the store below. This building was constructed by Messrs. Farnish and Sons, of Bradford.

Adjacent to the retort-house are the condensers and the tower scrubbers, erected by Messrs. R. Dempster and Sons. Near the scrubbers is the exhauster-house, containing one 60,000 c. ft. and one 40,000 c.ft. per hour exhauster and engines by Messrs. George Waller and Son, of Stroud. Near by are to be seen the tar-extractor, through which the gas goes, on leaving the exhausters, on its way to the scrubbers. From the scrubbers the gas passes through a rotary washer, then to the naphthalene washer, and from there to the purifiers, which are so constructed that they can at once deal with 1,500,000 c.ft. of gas per day. The tar-extractor, rotary washer, naphthalene washer, purifiers, and purifier-house were all constructed by Messrs. Ashmore, Benson, Pease, & Co., of Stockton-on-Tees.

The gas then passes to the meter and governor house. This building contains a 60,000 c.ft. per hour meter, and an 18-in. station governor, both by Messrs. J. & J. Braddock, of Oldham. From the meter the gas goes to the holder. This structure is of a design which has not before been erected in Barrow, and is worked on the spiral-guided principle. It has a capacity of 750,000 c.ft., is in three lifts, and when extended to its full capacity is 75 ft. in height above the tank, or 100 ft. in all above the ground level. This plant was erected by Messrs. Clayton, Son, & Co., of Hunslet, Leeds. The tank which contains the holder is also of special design, being constructed of reinforced concrete; and it stands practically on the ground-level. The contract for this work was let to Messrs. Gradwell & Co., of Barrow. The tank is 120 ft. in diameter and 25 ft. in height; and as it now stands filled with water, it contains 1,600,000 gallons. The whole structure, when filled, weighs some 9560 tons.

The steam used by the various engines is supplied from a boiler-house which contains two Lancashire boilers constructed by Messrs. I. & B. Umpleby, of Cleckheaton, and includes a chimney shaft 50 ft. in height. The whole of the buildings, with the exception of the retort-house, the purifier-house, and the coal-store, were erected by Messrs. Gradwell & Co. This firm also constructed the foundations to most of the plant.

It has been necessary to provide the works with sidings; and in this respect the site was very adaptable. The Furness Railway main line runs upon the northern side of it, and the Piel line on the southern side—the two meeting at the west end of the site. From this point, a low-level siding has been laid up to the retort-house; and advantage has been taken of the existing and disused Stank branch line, which has been widened and provided with the necessary loops, &c., in order that coal and coke may be delivered from this level to the various buildings which abut upon it. Both the sidings have been provided with railway weighbridges.

Provision has been made in the works to supply the Highways Committee with dehydrated tar for use in road construction; and a tar dehydrating plant has been laid down by the Chemical Engineering Company and Wilton's Patent Furnace Company, of Hendon. The lighter oils from the plant will be disposed of in the usual way by the Gas and Water Committee.

The gas-main upon the existing system has been extended from a point about Salthouse Railway Bridge, by means of an 18-in. cast-iron main, to the new works; this being carried out by Messrs. Gradwell & Co. It included a pipe subway under the Furness Railway Company's main line.

Owing to the war, it has been extremely difficult to obtain either material or labour; and the progress of the work has therefore been very slow. The yard has yet to be paved and boundary walls to be built; and there are certain small items in most of the buildings which have had to be left over for the time being. They are not, however, essential to the making of gas. The works have been in operation since Feb. 16, and have produced 39,558,000 c.ft. of gas up to the week ended June 9.

SOME SPEECHES.

Alderman NEAL, in his remarks, said the expenses of working the gas undertaking over the war period had been so heavy as to cause a loss during the past two years. This loss was due to a great extent to the impossibility of making sufficient gas without employing the carburetted water-gas plant. From time to time, additions had been made to the central works; and on each occasion it had been the endeavour of the Committee to instal the most up-to-date and efficient machinery with a view to reducing the cost of the make and improving the value of the product. As a proof of success in their endeavours, he mentioned that since 1870 the Committee had contributed £87,000 towards the relief of the rates. The Hindpool Road works now consisted of eighty through retorts, three gasholders of a capacity of 1,385,000 c.ft., and a carburetted water-gas plant to manufacture 500,000 c.ft. per day.

After the inspection, the party returned to the Town Hall for afternoon tea, at the invitation of Alderman Neal.

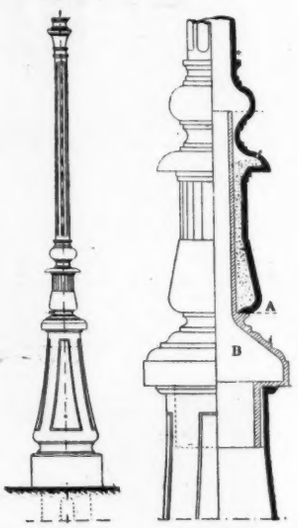
Alderman SMITH (the Chairman of the Electricity Committee) proposed "Success to the New Gas Undertaking;" and he pointed out that, when he first started his propaganda for electricity works many years ago, he urged that there would be no danger to the gas-works. Events had borne this out. The gas-works had been the "milch cow" of the Corporation; and he felt sure that they would again return to their old prosperity. There would be no rivalry between the Gas and Electricity Committees, excepting the friendly rivalry which was healthy and beneficial.

Councillor A. BROWN (the Vice-Chairman of the Gas and Water Committee), in reply, said that during his connection with the Committee they had had no need to seek new customers; they had always had a full demand for the gas. They expected great things from the new works opened that day; and he congratulated the contractors and also their former Borough Engineer and Surveyor, Mr. Arthur Race, who, with Mr. Chadderton (then Gas Engineer and Manager), did the principal work in the negotiations and laying-out of the works. Since Mr. Race left, the work had been supervised and controlled by Mr. W. C. Persey (the Borough Engineer and Surveyor) and by Mr. Chadderton.

Mr. J. W. BROADHEAD (Managing-Director of R. Dempster & Sons) returned thanks on behalf of the several Contractors; and Mr. HUMPREY CHAMBERS replied for Messrs. Gradwell & Co. Mr. Broadhead said comparisons were sometimes odious; but there was a lot to learn in comparing the old methods with those they had seen at the new works. When the Gas Committee in 1914 decided to instal vertical retorts in the new works, they were taking their courage in both hands, because a good many people at that time were not quite satisfied that vertical retorts, in every shape and sense of the words, were the right things. The experiences and results since then had, however, borne out the wisdom of the decision arrived at; and regarding the new works, he felt satisfied that the Town Council and the Gas Committee would find no cause to regret having placed the contract for vertical retorts in the hands of his firm.

WAR-TIME REPAIRS OF STREET-LAMP STANDARDS.

In a short note read before the Société Technique du Gaz in Paris on the 8th inst., M. Brodin, of the Vaise Gas Company, described a design of junction-piece which has been used in carrying out repairs to street-lamp standards—a course which has been necessary in consequence of the greater number of accidents due to heavy traffic and equally to the impossibility of obtaining new columns from the foundries.



A. New flat seating of column. B. Junction piece connecting the pedestal and column. C. Aperture for the introduction of cement.

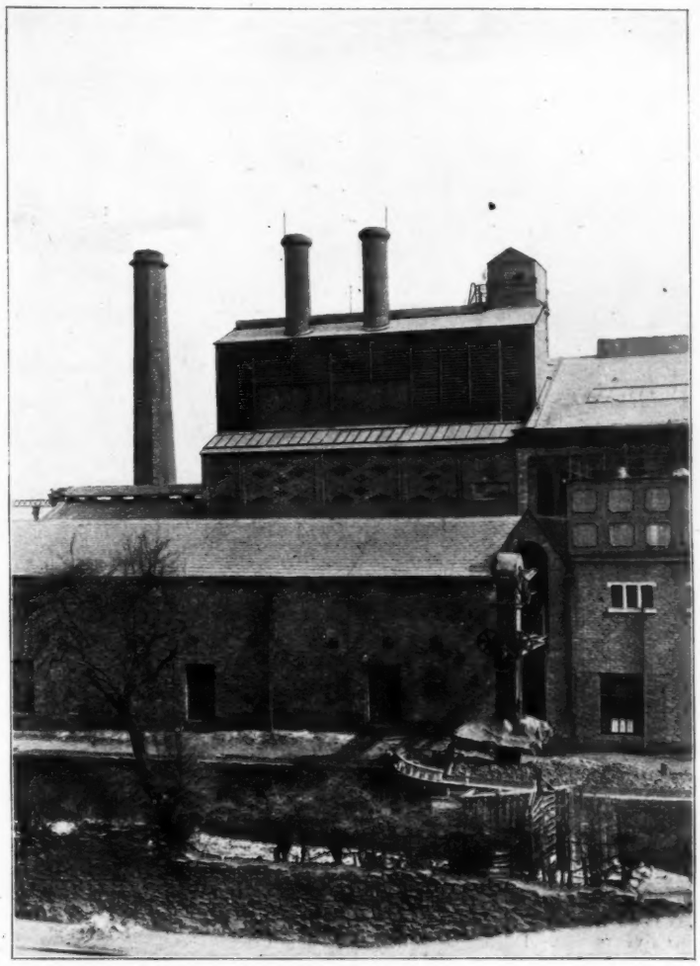
In fig. 1, A indicates the place where fracture almost invariably takes place. Fig. 2 is an enlarged drawing of the portion of the standard immediately above and below this point of fracture. The column and the pedestal are re-joined by means of a junction-piece B of cast iron and of the section shown shaded in the engraving. The junction-piece is secured in the pedestal of the standard; and the column is then placed over it after the broken surface has been given a flat seating. The two are then held in place by means of cement introduced through a hole C drilled in the column. A number of standards which have been repaired in this way are now in use by the Vaise Company. After re-painting the whole of the standard, the repair cannot be detected.

Destruction of Concrete by Gas Liquor.

A summary of an article on this question appearing in the current volume (XLI.), p. 161, of the "Chemiker Zeitung" is given in the "Journal of the Society of Chemical Industry." The author says a certain gas liquor tank of armoured concrete showed signs of leaking. The liquid which escaped contained ammonia (free and fixed), much calcium, and as acid radicle thiosulphuric and thiocyanic acids but no hydrogen sulphide or sulphuric or hydrochloric acids. The ammonium salts in the liquor had attacked the free lime in the concrete, forming soluble calcium salts. Coating the inside of the tank with materials such as tar was only partly effective, as it was difficult to avoid the development of cracks. A suitable lining to the tank was to be preferred—lead, iron, or glass being suggested. Zinc was not considered a suitable material. Where iron is used, it is recommended to keep the atmosphere of the tank free from air and so avoid rusting; and for this purpose coal gas is recommended.

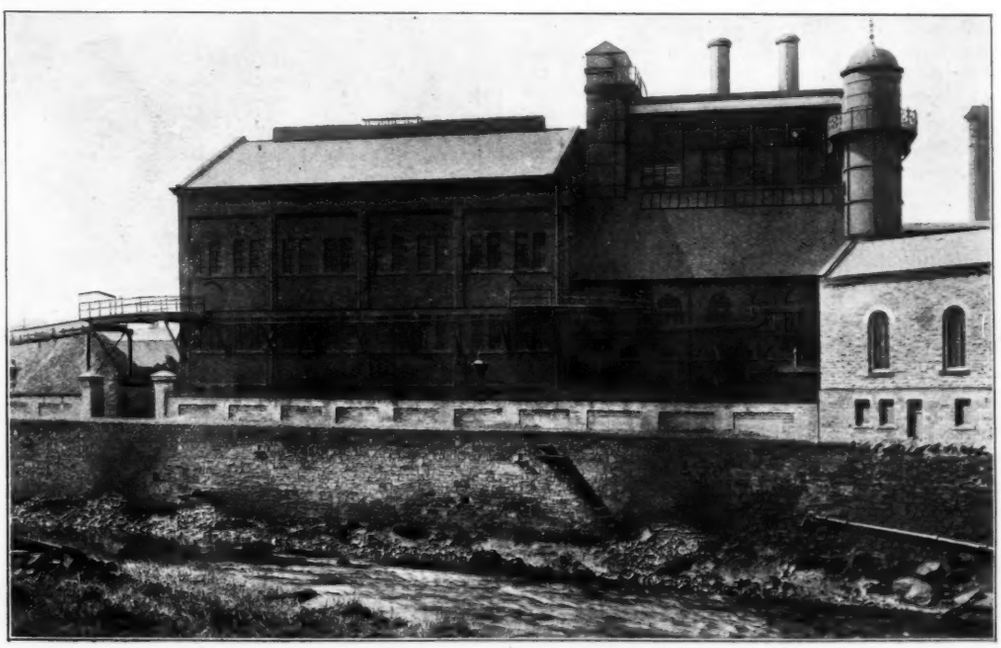
ELLAND AND ITS GAS-WORKS.

Extensions to the Carbonizing Plant—A Continuous Vertical Retort Installation on the Dempster-Toogood System.

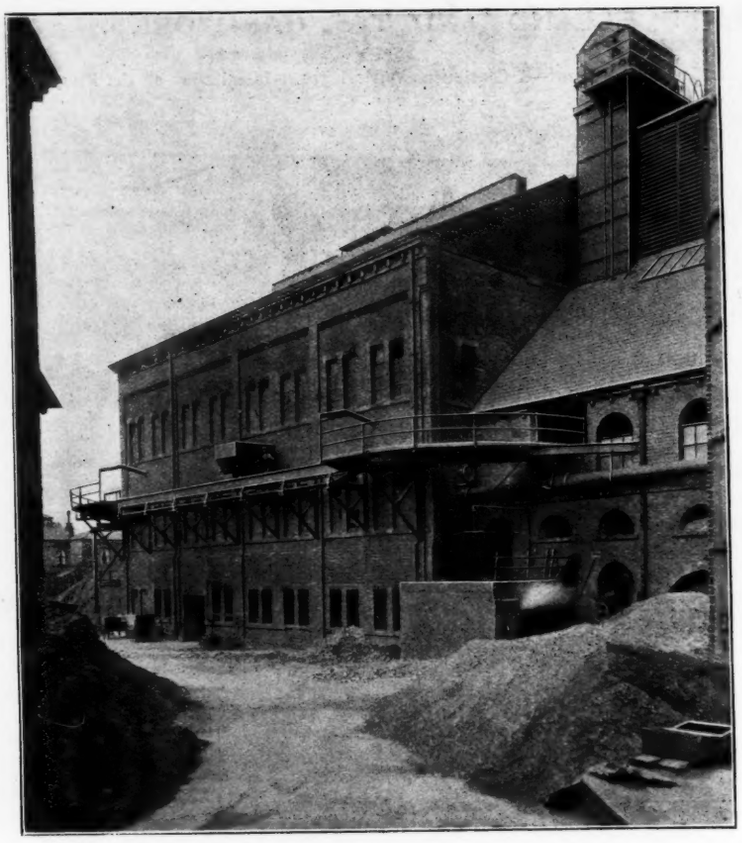


No. 1.—HANDLING COAL DIRECT FROM BARGE TO STORAGE HOPPERS.

THE Elland-cum-Greetland Gas Company and their Engineer (Mr. Robert Porter) have recently, in spite of the many difficulties existing during the war, installed—through Messrs. Robert Dempster and Sons, Ltd.—a new carbonizing plant on the continuous process. The principle of continuous carbonization is well known to our readers; but the application of the principle and the



No. 2.—VIEW OF THE WORKS YARD.



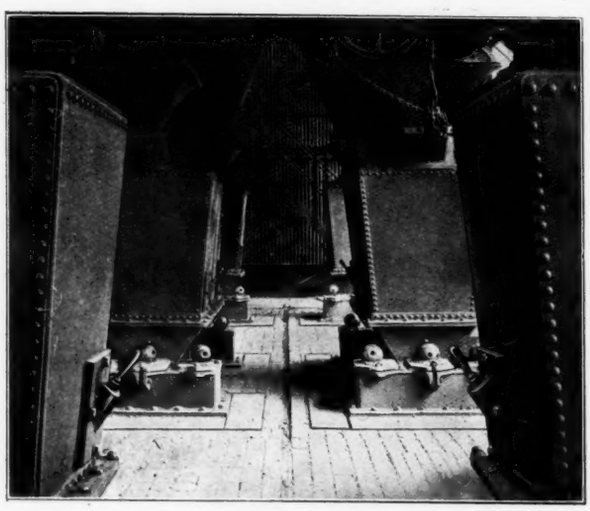
No. 3.—INCLINED GANTRIES CANTILEVERED OVER COKE-YARD.

adaptation of the particular system to any existing gas-works is always of live interest.

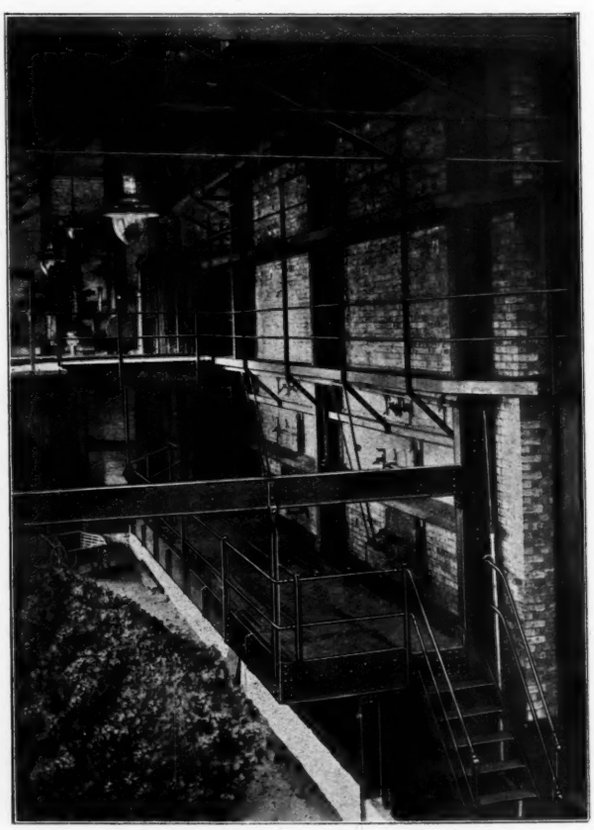
At Elland, the existing inclined retort-house—of very pleasing exterior and very substantially built from local stone—has always been a landmark to the vicinity. The coal-handling plant from barge by means of a rising and falling elevator was unique when first adopted some twenty-six years ago; and the gravity bucket conveyor was added some sixteen years ago. During the whole of this period it has given entire satisfaction, and proved itself most economical in use and maintenance.

It, therefore, became a duty to harmonize these excellent and outstanding features in the new plant; and the illustrations will show the two houses of almost similar height for the 25 ft. long verticals as for the inclines, and also the two benches being so aligned that a simple extension of the existing conveyor has permitted the whole of the economical coal-handling plant to be utilized with full merit for the verticals as for the inclines, with the additional advantage that the inclined retort-house will at some future date form an admirable coal-store of several thousand tons capacity—the gravity bucket conveyor both filling and emptying it of its future store of coal, which is a feature of moment in the aftermath of war. The vertical retort-house was originally a machine-worked horizontal retort-house before the date of the inclines—*i.e.*, some twenty-six years ago.

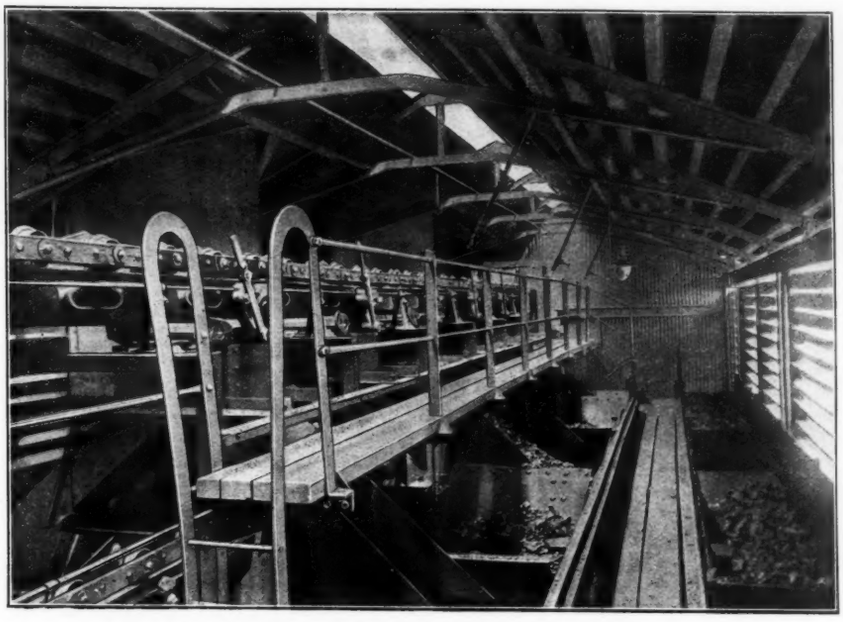
Reference to the illustrations will show that the substantial stone walls and bold ornamental guttering remain; the steel super-



No. 4.—COOLED BENCH TOP.



No. 5.—CONCRETE CLINKER FLOOR.



No. 6.—TOP OF FORTY-EIGHT HOURS' CAPACITY STORAGE HOPPERS.

structure and the 4½ in. red brick filling suitably enlarging the house. Nor is this all, as reference to the interior views will show that the cast-iron floor and rails on which the stoking machines ran over twenty-six years ago, blend with the new installation in forming an elevated covered coke-grading store.

Several hundreds of tons of coke are held in readiness for gravity loading (by means of sliding doors fitted in this floor) into carts beneath; and in this way the environments are blended to the new conditions in a very praiseworthy manner.

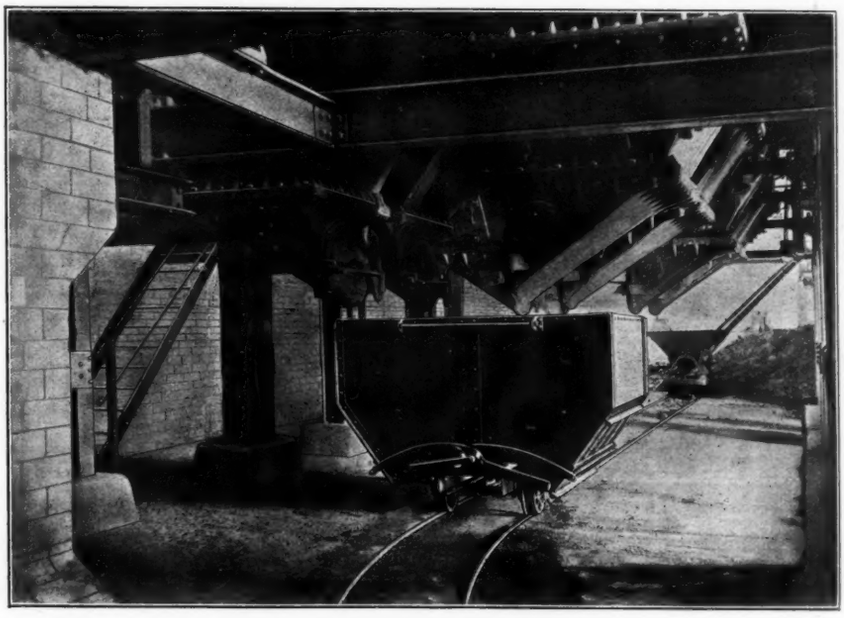
The carbonizing plant, of 500,000 c.ft. of gas per day capacity, consists of eight retorts, each rated to carbonize 5 tons of coal per diem. The retorts are built throughout of special grooved and tongued bricks. The maximum cross section of the retort is 5 ft. ×1 ft. 8 in., and the total length 25 ft. Hence it may be said that the advantage of the large throughput of coke-ovens is obtained without the necessity for mammoth machinery to handle the bulk of the charge, since in continuous carbonization the charge is continually being extracted in small doses, and is never handled in bulk. The retorts are grouped in two beds of four retorts each. The furnace for each bed has an independent chimney, and is of the step-grate type. There are two producer gas off-takes, so that two or four retorts may be at work on each furnace. The furnaces are fitted with secondary and primary air heating and saturating arrangements, in accordance with the contractors' well-known patents.

Each retort is fitted with an independent seal-valve and hydraulic main, so that the widest possible range of adjustment and control is given into the hands of the carbonizer for the control of gas egress; and similarly Dempster's patent reciprocating cool coke extractor gear can be adjusted independently for each retort.

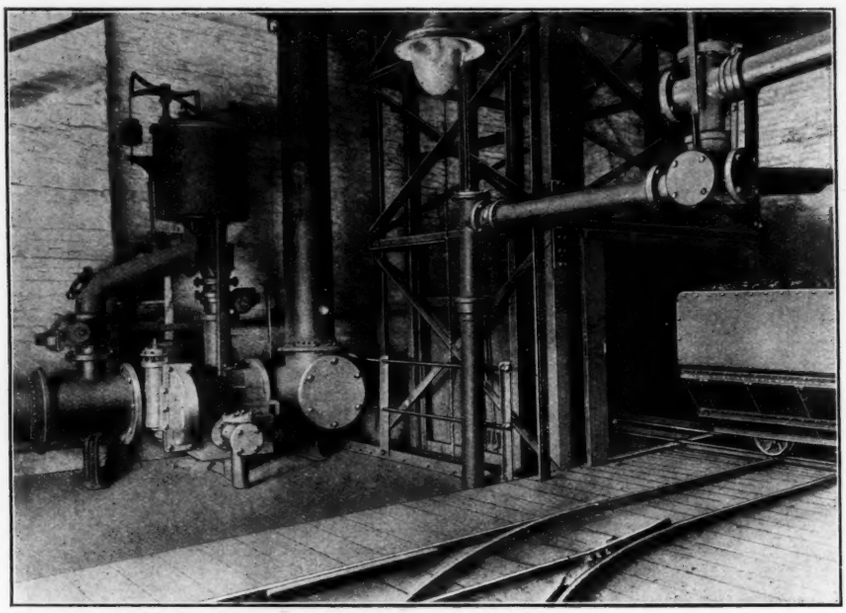
The overhead storage hoppers contain a forty-eight hours' storage of coal and coke for the retorts and furnaces; the coal being handled direct from barge by means of a simple extension of the existing gravity bucket conveyor—the coke being handled direct from the retorts *viâ* the hoist. To maintain supplies for any emergency, the conveyor is so provided with shoots and tippers that it may, in addition to coal, likewise handle the coke to the coke compartments of the storage hoppers, and *vice versâ* the truck rails are extended to the coal-stores so that coal and coke may be handled *viâ* the hoist.

The hoist, of 2 tons capacity, is mechanically driven by means of open and crossed belting and worm-gearing; the belts being shipped by a special cam appliance, whereby the attendant has only the work of shipping one belt at a time—the brake being automatically applied and released by the shifting of the belt gear. The hoist is very completely fitted with automatic devices, so that a coke-truck of large size (some 35 cwt. gross load) can readily be manipulated to and from the cage. The difficulty hitherto experienced with mechanical hoists, of stopping exactly at landings, has been totally overcome by Messrs. Dempsters.

The coke handling from the retorts is performed by trucks. Sufficient coke for the current market is deposited at the ground level, and surplus coke is discharged into the large capacity coke-truck, and thence by inclined gantries, so that the full truck



No. 7.—COOLED COKE RECEPTACLES UNDER RETORTS.



No. 8.—APPLICATION OF RETORT-HOUSE GOVERNOR.

gravitates to the storage hoppers, covered coke-grading store, or coke yard.

The gantry to the coke yard spans the narrow neck at the entrance to the works, by means of cantilever brackets. In this way no impediment whatever is thrown in the way of coke cartage, and full convenience is available for the future adoption of screen and feeding hoppers.

The motive power employed is gas. A new 30 H.P. gas-engine has been installed with the plant and coupled to the line shaft, which is driven by an existing 30 H.P. gas-engine such that the two engines are at liberty in combination or independently to drive all motions—that is the coal plant, hoist, and coke extracting mechanism. A small engine has been installed to run the coke extractor gear at night time and on Sundays.

The plant coming between the river and the canal on a narrow neck of land (which land was at this point subject to the weight and vibration of the buttress of the railway bridge spanning the road, river, and canal), it was deemed advisable to somewhat reinforce the foundation. Consequently, the foundation—some forty years old—of the horizontal bench was skimmed, and a cap of reinforced bars knit on. This construction has proved perfectly sound for bearing the concentrated loads of the vertical retort stanchions.

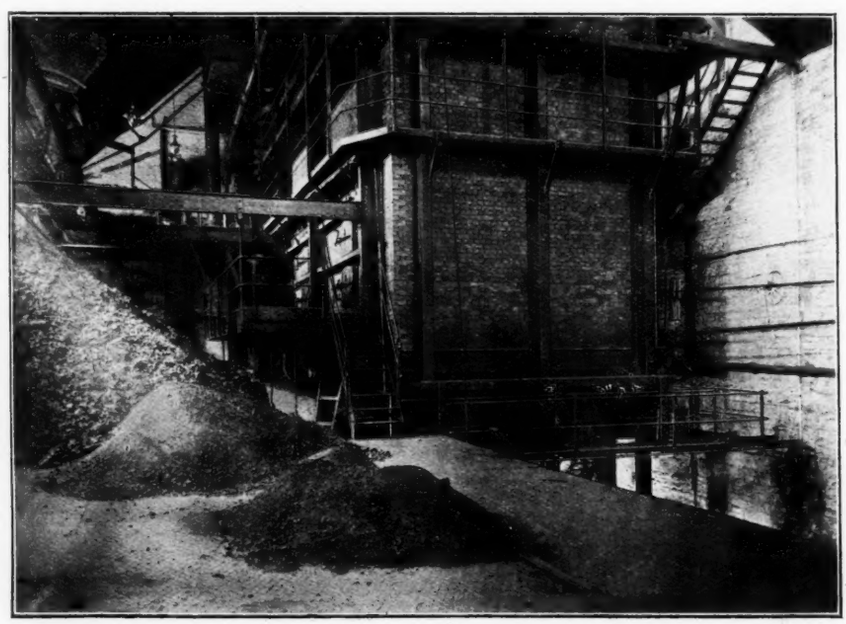
Reference to the illustrations will likewise show the application of the retort-house governor. These much-despised machines are usually the victims of circumstances—being cramped in hot, dusty, and ungetatable corners. The illustration shows clearly the application. The governor stands on a seal pot, whence deposits can be removed with the greatest ease and despatch—the thermometer and gauges being likewise at hand. The branch pipe from the governor is provided with a liquor dribble, to dissolve any crystal formation before the formation can be protected by a coating of tar. This constancy of action is one of the secrets of choke prevention.

Visible from the illustration also are the characteristic features of the Dempster-Toogood system of continuous vertical retort carbonization, as the combustion chambers with the accommodating platform bracings, which give clear walking ways around the bench, are situated at a distance from the retort top, and all at one level—thus facilitating temperature taking. Similarly, the control dampers are placed where the temperatures are considerably less—*i.e.*, at the top of the retorts; and a similar platform and bracing give the fullest means for control.

The clinkering floor is spacious, and the grid and ashes hopper arranged in the concrete floor permits of the hot ashes gravitating away from the stoker on being raked from the ashpan to await removal at the ground level.

The bench top paving is tubular cooled and the chimneys lagged with vented asbestos, so that in combination with the grouping of the coal-bins resting on the top mouthpieces (whereby spacious working room is given to the stoker on each bench top) the conditions of working on the bench are greatly improved.

The twin gas-tight valve admits coal or coke to the retorts, as required, from the overhead storage hoppers; and the fuel for



No. 9.—COVERED COKE-GRADING FLOOR.

the furnace falls by gravity direct from the hoppers to the furnace charging lid.

At the base of the retort it will be observed that steam can be regulated to each retort for the purpose of making a percentage of water gas if desired, so as to swell efficiently and fairly the B.Th.U. produced per ton of coal carbonized.

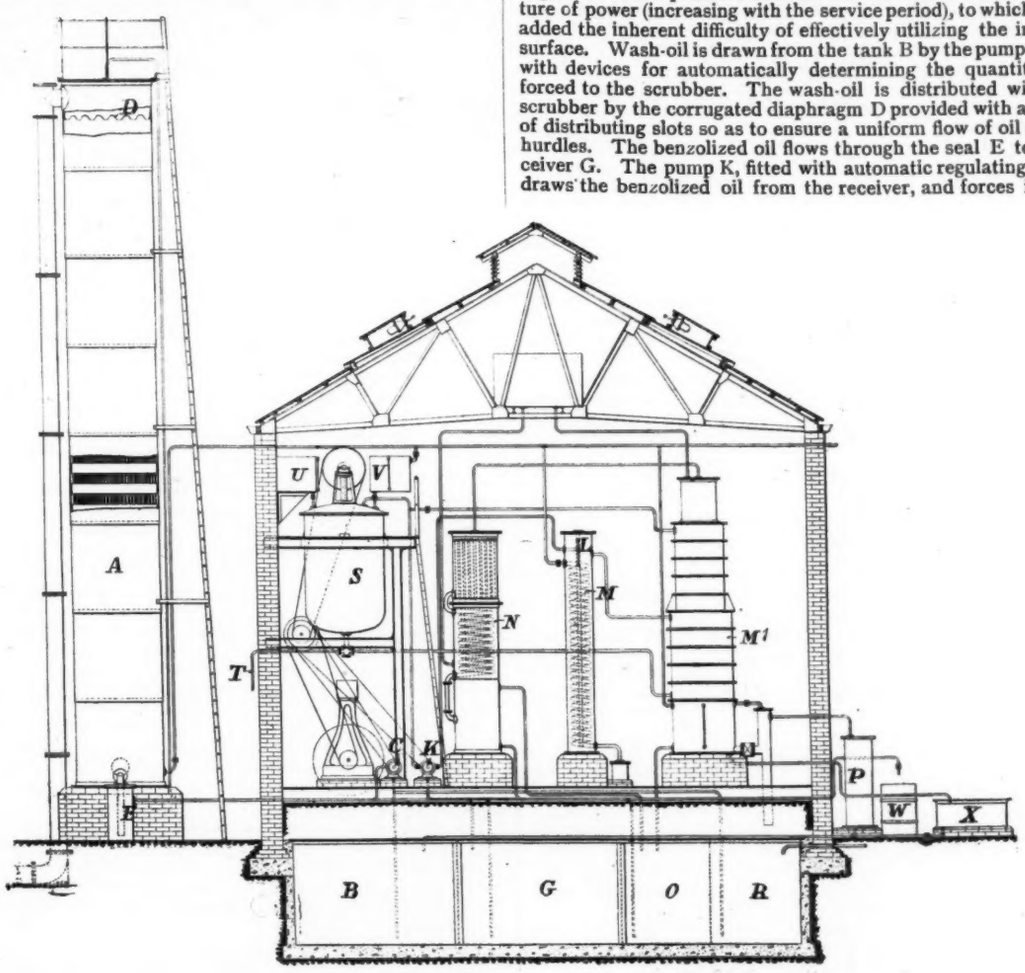
The residual heat in the spent coke before being discharged is conducted into the secondary and primary airs for re-use on the heating of the charge; so that the coke leaves cool enough for direct handling by consumers' carts or, alternatively, for storage purposes.

After the war it is intended to take into consideration the application of coke screening and grading hoppers for the development of the household coke market, which we all look forward to. When this is effected, the installation will be one of the most complete among vertical installations in this country.

BENZOL RECOVERY AND REFINING PLANT FOR SMALL GAS-WORKS.

By D. BAGLEY.

WITH purely arbitrary deductions or allowances for a given candle power standard, volume of water gas in total make, &c., probably between thirty and forty million gallons of rectified benzol might be annually available from British gas-works. A large proportion of these works, however, are of relatively limited capacity—carbonizing from 10,000 tons per annum and upwards; and the installation of plant for such capacities presents a commercial problem of some intricacy. The design, too, must be modified to suit the conditions precedent in order to attain the requisite return.



Geographically, the position of many of these small works is ideal, if they are in a position to supply a standard quality of benzol suitable for motor purposes which is likely to constitute the principal demand. Crude and impure qualities are useless for this important usage, and a definite standard becomes an imperative condition if benzol is to successfully compete with imported spirits—a factor recognized by the Gas Institution. In designing plant suitable for these small works, I have introduced a method whereby the crude benzol may be rectified in a part of the apparatus utilized for separating it from the wash-oil by certain modifications thereto, so avoiding the loss of wash-oil sent away in the crude when refined at a separate distillery, and permitting the production of standard and purified qualities of benzol immediately available at the point of production, with but slight additions to the plant. The commercial advantage will be obvious, *inter alia*, in the avoidance of carriage to and from the distillery, and the distillers' profit, on the assumption that the gas-works are to make the fullest use of their favourable position in the distributing system of the country, and a sensibly increased yield.

The illustration depicts the proposed plant in diagrammatic form (the several parts of which are protected by letters patent). The scrubber A, into which the benzol-containing gases are first conducted, is fitted with hurdles designed to give the least resistance to the gases, and avoid any radical alterations to the exhausters. A tendency has been observed in recent proposals to substitute other contact-mediums for the hurdle, which apparently neglect the back-pressure exerted and the concomitant expenditure of power (increasing with the service period), to which may be added the inherent difficulty of effectively utilizing the increased surface. Wash-oil is drawn from the tank B by the pump C, fitted with devices for automatically determining the quantity of oil forced to the scrubber. The wash-oil is distributed within the scrubber by the corrugated diaphragm D provided with a number of distributing slots so as to ensure a uniform flow of oil over the hurdles. The benzolized oil flows through the seal E to the receiver G. The pump K, fitted with automatic regulating devices, draws the benzolized oil from the receiver, and forces it to the oil-heater L provided with a closed coil M which may consist of two separate sections. The benzolized oil is preheated to the degree required, and flows into the lower section of the still M^1, meeting a current of direct steam, which distils off the benzol vapours—the mixture carrying the naphthalene removed from the gases, and a certain proportion of the wash-oil. The mixed vapours flow into the condenser N. This consists of three sections, the upper fitted with vertical tubes, the central with a cooling worm, and the lower forming a receiver and separator for the mixture of crude benzol, &c., and condensed water. The crude benzol flows into the receiver O. The debenzolized oil is cooled in the cooler P and then returned to the tank B, and again put into circulation. The absorptive power of the oil is practically equivalent to that of the fresh oil. A tank R is provided for fresh wash-oil.

Assuming, for the purposes of illustration, a daily output of 100 gallons of crude benzol, and thus an accumulation in a certain period of a quantity suitable for the refining process, the capacity of the benzolized oil-tank is designed to accommodate benzolized oil while the still (converted) is treating the accumulated crude, and to gradually work-off the accumulated benzolized oil during the period in which the crude benzol is being

stored. The limits of the operation are obviously circumscribed by the tankage, and the capacity of the still; but, generally, the process can be utilized on a scale somewhat greater than that illustrated. For larger capacities—up to (say) 50,000 tons of coal annually—a separate rectifying still is recommended.

The refining process is as follows: A section of the pump K is placed in connection with the crude-benzol tank, and forces crude benzol to the agitator S. The crude oil is treated successively with concentrated sulphuric acid and water; the impure acid and water being discharged through the pipe T, and then with a solution of caustic soda being finally well washed with clean water. Gauged receptacles U V are for the acid and caustic solution.

This treatment proceeds while the debenzolization of the enriched wash-oil is in progress in the plant. A section of the pump K is then placed in communication with the crude-benzol tank O, and crude benzol is pumped to the upper part of the still M^1, which has been adjusted for the rectification of the crude benzol—the still being washed-down by these means. Washed crude benzol is then admitted by gravitation to the converted still, and distillation proceeds with a closed coil.

The vapours pass through certain sections of the column, and flow to the condenser, when the first runnings are rejected and returned to the crude-benzol tank. The refined condensed benzol is then discharged by separate fractions through a check receiver, fitted with a steam ejector for vacuum distillation, into receptacles or drums W, and is then ready for use. If drums are employed, an automatic filling valve regulates the flow.

The distillation of the higher homologues of the benzol series may be assisted by direct steam towards the close of the operation. Upon completion of the rectification, the still is again converted for debenzolizing the wash-oil; the residue of wash-oil containing naphthalene being previously discharged into the crystallizing tank X; the naphthalene separating; and the oil being returned to the oil-tank, while the benzolized oil is again put into circulation through the heater and the still.

Generally, the plant is designed to operate with only occasional supervision. This is accomplished by effectively regulating the flow of oil both through the scrubber and through the debenzolizing apparatus, and maintaining a recorded check on the quantity of crude oil produced. Obviously, while the washing of the crude and the refining is proceeding more supervision will be required; but, inasmuch as the quantities of acid and caustic solution for washing are predetermined, and a recorded check on the temperatures maintained (which may be effected at a central point), little expert knowledge will be required when the mixture of the distillates has been settled according to the finally desired products.

Primarily, the object of this plant is to reduce the capital expenditure to a limit which will ensure an adequate return. The production of a standardized pure product *in situ* avoids the loss of wash-oil—and with it certain constituents removed in the washing process—and adds pence per gallon to the final product. Probably, without exception, the local demand for motor purposes will ensure the absorption of the output from all plants with little effort in the direction of retailing.

The still performs the two functions of debenzolizing the enriched wash-oil and refining the crude benzol by a simple device which can be immediately adjusted. The heat balance of the plant (in which is included the excess power for the exhauster, the pumps, and the agitator) conforms approximately to the larger units, while it is possible in a small plant of this character to utilize a part of the sensible heat in the hot debenzolized oil from the still for partially preheating the cold benzolized oil. Condensed water from the closed steam-coils is automatically returned to the boilers.

Finally, assuming that the conditions permit, up to 90 p.ct. of benzol may be withdrawn from the gases, which may be contrasted with from 10 to 20 p.ct. less where the usual standard specification of crude has to be complied with. This is an advantage of the greatest importance from the economic aspect.

FUEL AND POWER SUPPLY.

By E. W. L. NICOL, Fuel Expert to the London Coke Committee.

[From the "Electrician," June 15.]

> "Having regard to the experience obtained in the present war, this Conference records its opinion that the safety of the Empire and the necessary development of its component parts require prompt and attentive consideration, as well as concerted action, with regard to the following matters: 1. The production of an adequate food supply and arrangements for its transportation when and where required, under any conditions that may reasonably be anticipated. 2. The control of natural resources available within the Empire, especially those that are of an essential character for necessary national purposes, whether in peace or in war. 3. The economical utilization of such natural resources through processes of manufacture carried on within the Empire. The Conference commends to the consideration of the Governments summoned thereto the enactment of such legislation as may assist this purpose."—Resolution passed by the Imperial War Conference, April 25, 1917.

AMONG the many resolutions passed by the Imperial War Conference, one or two are of peculiar and immediate interest to engineers responsible for the production of power on a large scale. The proposed State control of essential national resources, with the view to their economical utilization, and the development within the Empire of adequate capacity for the production of food and munitions, will not only involve radical reorganization in the use of coal generally, but particularly in that of the bituminous coal from which the chemical fertilizers and other materials essentially necessary for national purposes are derived.

Under these changed conditions, in order to combine the economy of the coal carbonizing process and the operation of electrical generation, so that the highest degree of the economical use of bituminous coal may be fully realized, the co-ordination and *pro ratâ* development of the basic industries of fuel and power supply may ultimately become necessary, in view of the vital industrial and defensive importance of adequate and cheap supplies both of fuel and power.

The use of coke (and other surplus combustible residuals) as fuel for steam-raising, and the consequent necessary changes in steam-boiler design, rating, and firing methods will, in the event of the recommendations of the conference being adopted, provide new engineering problems of the most interesting and immediately practical character.

In the present article it is proposed to consider, *inter alia*, the mechanical stoking of large capacity steam-boilers exclusively with gas coke as fuel, and to indicate, if possible, the lines upon which, in the light of present experience, experiment and research may be directed with the view to improving and standardizing steam generating appliances used, as well as to elucidating factors advantageous to the efficient combustion and utilization of non-volatile coke fuel for power production.

In modern coal carbonizing practice, both horizontal (or inclined) and vertical retorts are used for the destructive distillation of bituminous coal; and to those unacquainted with their working, a brief description may be interesting. Both types of retorts usually are heated by means of regenerative gas producers, and both are charged and discharged by mechanical power. From horizontal (or inclined) retorts the coke is discharged at the working temperature—viz., 1500° to 1800° Fahr.—into conveyors, where it is immediately quenched with water, or into skips, which are conveyed by telpher and lowered into a tank of water placed outside the retort-house. The producer furnaces are generally fed with incandescent coke direct from the retorts. An essential difference in the working of the vertical retort is that the coke, before being allowed to gravitate from the retort, is cooled in a cooling chamber and is discharged practically cold.

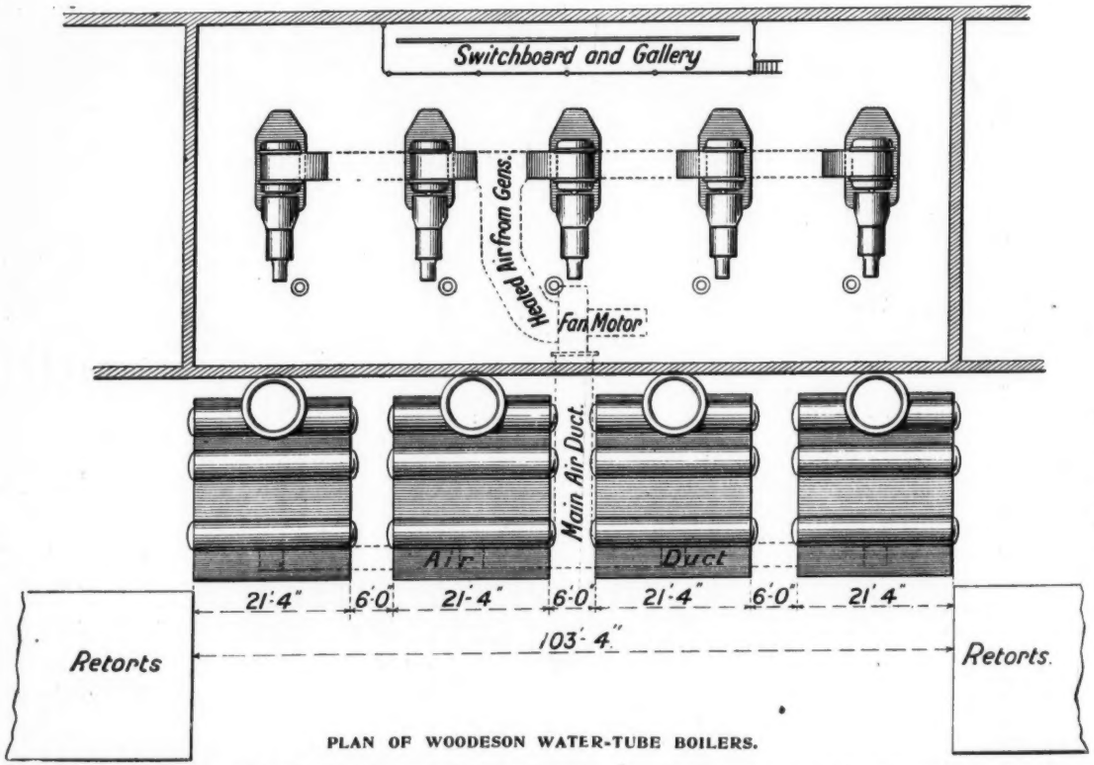
For the purpose of steam-raising there are thus available two kinds of gas coke—"vertical" coke, relatively light and porous, and "horizontal" coke, of various degrees of hardness and density, either incandescent for immediate local use, or quenched for storage and distribution. From either kind there is also a certain amount of small residuum, called coke breeze.

The sensible heat unavoidably wasted by the quenching of "horizontal" gas coke represents a considerable proportion of the total heat used for carbonizing the coal, which, if it could be used for the purpose of steam-raising, would appear to offer attractive possibilities in a combined fuel and power supply centre laid out on the lines indicated on the drawing. By thus utilizing the sensible heat as well as the combustion heat of the surplus gas coke in a suitably constructed boiler-furnace a considerable saving in fuel would be effected, as well as economy in transport and in various other directions.

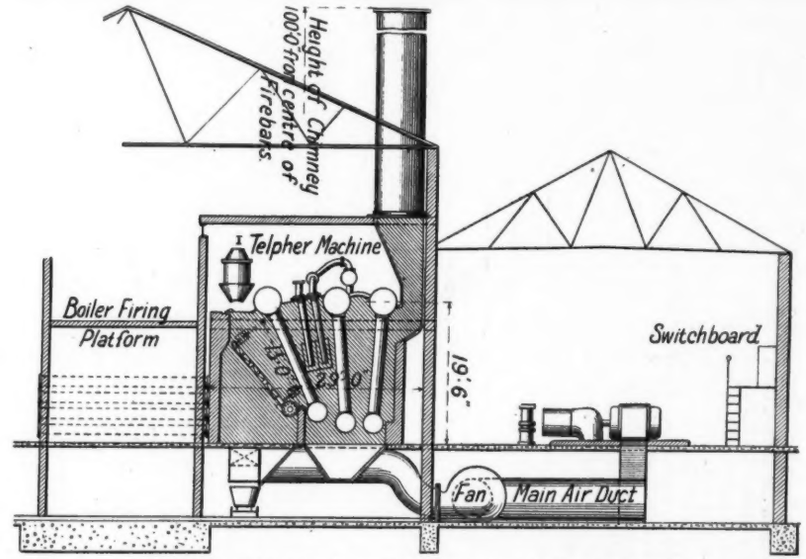
Consideration of these features might form a starting point for the development on a working scale of an experimental boiler and furnace for use with coke as fuel. One type of furnace suggested by the writer has an inclined grate, and is indicated on the drawing (for which he is indebted to Messrs. Clarke, Chapman, & Co., Ltd., of Gateshead-on-Tyne). The furnace as shown is intended for use with coke exclusively, incandescent or otherwise; so that the boiler-tubes, so far as possible, are exposed to the direct radiant effect of the burning fuel—no intervening baffle, arch, or secondary combustion space being considered necessary or desirable.

Whatever the merits or demerits of any such scheme may be, more immediate interest will be centred upon adapting existing steam-generating plant to the use of coke as fuel. So far as hand-fired boilers are concerned, experience has shown that, with few exceptions, existing types are more or less easily adaptable; any necessary conditions essential to the attainment of satisfactory results being readily applied. Positive control of the draught pressure, under as well as over the fire, is in all cases desirable, although not an absolutely essential feature.

Experience in mechanically stoking relatively large-capacity boilers with gas coke or coke breeze as fuel, though necessarily more limited, would appear to be no less definitely established. For internally-fired steam-boilers, and to some extent externally fired water-tube boilers, various forms of forced draught "sprinkler" stokers have been applied, apparently with satisfactory results. For firing coke and breeze on a larger scale, the Babcock and Wilcox Company have adapted their well-known chain grate stoker by applying forced draught under the grate. The test results obtained with the first experimental installation, which has been working practically continuously night and day since January, 1916, are to some extent qualified by the fact that the insulation of the boilers had not been completed at the time the test was made. Data collected over a more extended period are available in connection with the mechanical coke-burning installations made by the Underfeed Stoker Company.



PLAN OF WOODESON WATER-TUBE BOILERS.



SECTIONAL ELEVATION OF HORIZONTAL RETORT-SETTING.

Their forced-draught over-feed travelling grate stoker has now been in use with coke breeze exclusively as fuel over a period of six years, with results that are considered satisfactory, both as regards relative cost of maintenance and efficiency, in circumstances which necessitate continuous operation at maximum loads over long periods. Records of one such installation are available, showing an interruption of only four days since going into commission some eighteen months ago. In other boilers, in similar circumstances, the ignition arches have lasted for fourteen months. A contributory beneficial effect to this very satisfactory performance of both mechanical stokers and brickwork is no doubt the prior elimination, in the process of carbonization, of the volatile sulphur, which is one of the destructive elements in all natural coal fuels.

In general principle, the Underfeed Company's travelling-grate stoker is similar to the familiar chain-grate stoker, in that the grate travels over two drums or sprockets at either end of the grate. The coking arch, as used for bituminous coal, is retained in a somewhat modified form; and this feature, combined with impelled draught, has the effect of largely extending the range of choice of fuels which may be used—an important consideration from both the commercial and the national view-points. With the ordinary natural-draught mechanical coking stoker the user is limited, to a considerable extent, whatever his geographical position or the character of local fuel supplies, to more or less uniform grades of bituminous coal—a disadvantage which has been sharply revealed by the present conditions of coal shortage and transport difficulties.

Among the various fuels which the makers claim to be satisfactorily dealt with by the travelling grate stoker are gas coke (suitably graded), gas-coke breeze, furnace and foundry coke breeze, anthracite grains, duff and rubbly culm, anthracitic Welsh coal, and bituminous coal.

This is, no doubt, a very sanguine achievement for any one type of stoker; but, from the point of view of both the fuel user and the fuel producer, it is doubtful whether with any set of fixed conditions of use the best results are obtainable from such a variety of fuels differing widely in chemical composition, and volatilizing and ignition temperatures. For instance, the large primary coking and secondary combustion spaces necessary for the complete combustion of a "two-stage" fuel like bituminous coal are neither desirable nor necessary for a "single-stage" fuel like gas coke, which, preferably, should be burned directly to carbon dioxide in contact so far as possible with the heating surfaces of the boiler.

In dealing with the latter fuel, the function of the coking arch, which to a considerable extent screens the most effective heating surfaces from the direct radiant heat of the fire, is reduced merely to a convenient means of maintaining a sufficient temperature at the furnace door to ensure the ignition of the coke as it enters the furnace; and it would appear to be in this regard that experiment on a working scale is most required, with the view to improving the design of both boiler and furnace, and also the methods of mechanically stoking and clinkering coke-fired boiler-furnaces.

An important feature of the travelling grate stoker is the provision made for the relative regulation of the draught in varying degrees of intensity from the front to the back end of the grate. The depth of fuel usually admitted in using average coke breeze and graded coke is varied between 8 in. and 12½ in., according to grade and resistance of the fuel bed.

This adjustment, which is made in the usual way (as required) by regulating the height of the opening for the admission of the fuel under the furnace door, and also that of the relative draught intensity, requires no more than ordinary supervision. But failure to recognize and adjust these elementary factors has resulted in sulphurous fumes being blown back into the boiler room, when either coke or coal is used—the fumes in the latter case probably being considered less sulphurous by reason of the disguising effect of other gases more or less malodorous.

In power plants where normal conditions necessitate the continuous working of boilers at or over their full capacity, as rated on a volatile coal fuel basis, the cutting and grading of coke to the most advantageous sizes will be an important feature. The resistance of coke to rapid oxidation varies considerably; and this factor would appear to have some definite relation to its hardness and density. The ratio of surface exposed to the oxidizing process to unit of weight also has an important influence

upon the economic rate at which coke may be consumed; and the desirability of grading to approximately uniform size will be obvious.

The various standard grades adopted three years ago by the London Coke Committee—viz., 0 to ⅝ in., ⅜ in. to ¾ in., ¾ in to 2 in.—have been so far sufficient to meet the special requirements of steam-users for both mechanical and hand firing. But here, again, arise factors having an important bearing on the efficient stoking of coke by mechanical means, and also upon the economical rating of coke-fired boilers, which can be determined only by organized and systematic experiment and research conducted on a working scale under competent supervision.

The comparative evaporative values of coke and coal as fired under various conditions, and also the relative evaporative capacity of coal and coke-fired boilers, will be of interest. Where appliances for the positive control of the furnace-atmosphere are installed, coke has a decided inherent advantage over bituminous coal, in that it contains practically only one combustible constituent—fixed carbon. Under the best conditions of mechanical stoking, bituminous coal has a relatively low efficiency, as it requires for the complete combustion of its numerous and ever-varying fixed and volatile constituents (which include hydrogen) at least 50 p.ct. excess of air. This figure corresponds to some 13 to 14 p.ct. of carbon dioxide in the flue gases—a desirable result which is, in the writer's experience, only very rarely obtained in ordinary practice. With all due deference to those in charge of well-conducted steam plants, it is now suggested that 5 to 8 p.ct. of carbon dioxide, indicating 300 to 150 p.ct. excess of air, would probably cover the higher limits of working where bituminous coal is used at high rates per grate-foot-hour under ordinary conditions of draught and supervision. Compared with bituminous coal of equal gross calorific power, coke—which is relatively uniform in character and composition, requires a minimum excess of air, and no secondary air supply in order to complete its combustion—will have a higher net evaporative value.

The following are typical results obtained with bituminous small coal, gas coke, and coke breeze of good average quality under various conditions of mechanical and hand firing:

——	Coal.	Coke.		Breeze.		
System of draught	Natural	Impelled.		Impelled.		
System of stoking	Mech.	Hand.		Hand.	Mechanical.	
Type of boiler	W.-tube	Lanc.	Cornish	B. & W.	Stirling	B. & W.
Grate surface, sq. ft.	87·88	36·0	29·0	81·0	60 75	50·0
Fuel per grate-ft.-hour lbs..	26·9	15·0	16·1	25·2	37·1	28·28
CO_2, p.ct.	8·0	14·0	16·0	14·5	14·5	11·7
Excess air, p.ct.	159·0	48·0	28·0	43·0	43·0	75·0
Fuel loss, p.ct.	23·0	13·0	11·0	12·5	12·5	..
Calorific power in B.Th.U.	12,000	12,000	12,000	10,083	9,590	9,018
Evaporation from and at 212° Fahr. per lb. of fuel as fired	7·5	9·8	9·8	7·84	5·8	6·59
Plant efficiency, p.ct.	60·3	78·8	78·8	75·1*	69·6*	71·01*
Current rates quoted f.a.s. London, per ton	28/-	28/-	28/-	10/6	10/6	10/6
Fuel cost per 1000 gallons evaporated	16/8	12/10	12/10	6/-	8/-	7/1

* No economizer or superheater.

PEAT, WOOD, AND LIGNITE IN GAS MAKING.

The first technical congress, though a very brief one, which the Société Technique du Gas has held since the outbreak of war took place in Paris on June 8, when the chief subject of communication was the use of substitutes for coal in gas manufacture. As has been recorded in our pages, for some months past efforts have been made in many quarters in France to utilize both peat and wood as a supplement to the restricted supplies of coal which are obtainable. At the congress this question came before the industry in the shape of three short papers, of which the following is a translation.

Peat for Gas Making.

The carbonization of peat was the subject of tests at the La Villette works from 1861 to 1866, though at that time the aim in view was chiefly the production of coke, tar, and ammoniacal liquor. Tests were made of peat from deposits at Mareuil, St. Maxence, Sens, Mailly, and Canizy. Samples from these different sources were distilled in the ordinary gas-retorts of the period in the form of briquettes containing about 22 p.ct. of water. It was found that 100 kilos. of crude unpurified peat yielded from 45 to 50 p.ct. of coke (containing 30 p.ct. of ash) and 12 p.ct. of tar. The yield of gas was 20·4 cb.m. (7300 c.ft. per ton) and 17 litres of ammoniacal liquor (38 gallons per ton). In the case of purified peat, the yield of coke was about 60 p.ct. (containing 6 to 7 p.ct. of ash) and of tar 15 p.ct. The yield of 100 kilos. was 25·4 cb.m. of gas and 20·9 litres of ammoniacal liquor, which correspond respectively with 7500 c.ft. of gas and 46 gallons of liquor per ton of peat. In illuminating power the gas was found to rate as 150 to 300 litres for one carcel.

Experiments on these lines were resumed in 1887. The results are shown in the tables, from which it will be seen that both the yield of gas and the illuminating power varied very widely with the source of the peat. The proportion of carbonic acid ranged from 16 to 25 p.ct., and there was a similar variation in the percentage of water in the peat, in the yield of coke, and the percentage of ash in the latter. The production of ammonia was marked by the two limits of 4·1 and 2 kilos of ammonia per 1000 kilos. In the case of certain samples of peat, a substance of consistency intermediate between resin and wax was a constituent; but, in default of a sufficient quantity of it, it was not possible to determine its nature.

Description of Peat (Air-Dried).	Gas, Purified.			Carbon Dioxide in Gas.	
	Gas Produced per 100 Kilos Peat.	Consumption to Equal Lighting Power of 42 Gms. Coal Gas (Paris) of Power 105 Litres per Carcel.	Gas Produced, Calculated as of 105-Litre Lighting Power.	Unpurified.	Purified.
	Cb.M.	Litres.	Cb.M.	P.Ct.	P.Ct.
Peat from Brittany—					
Spongy	24·5	96	26·7	18	2
Hard	30·1	90	35·0	16	1
Glezy-Blanzy peat (Somme)	32·0	139	24·0	22	2
Daours peat (Somme)	27·0	200	14·0	18·5	2
Peat from Voulzie Valley, near Provins (Seine et Marne)	26·0	288	9·4	25·0	1·5
Peat from Voulzie Valley, another sample	31·0	210	15·5	20·0	1
Dutch Peat—					
Sample No. 20	34·2	159	22·5	18·0	1
Sample No. 21	30·0	110	28·6	21·0	1

Peat from:	Moisture Est. at 100° C.	Volatile Matter Other than Moisture.	Coke.	Ash in Coke.
	P.Ct.	P.Ct.	P.Ct.	P.Ct.
Somme—				
Querrieu No. 1	16	34·3	49·7	66·3
,, ,, 2	19	45·3	35·7	41·6
,, ,, 3	20	47·75	32·25	28·9
,, ,, 4	14	46·8	39·2	44
Daours No. 1	21	47·7	31·3	21·6
,, ,, 2	14	45·65	40 35	44·7
Glezy-Blanzy No. 1	24	40	36	23·4
,, ,, 2	23	44·3	32·7	25·8
,, ,, 3	23	46·5	30·5	24
,, ,, 4	24	40·5	35·5	22·2
Voulzie Valley (S. et M.)	26·5	45	28·5	22 1
Holland—				
Sample No. 2	14	51·4	34·6	16·2
,, ,, 3	15	52·2	32·8	17·2
,, ,, 6	15	51·3	33·7	27·2
,, ,, 10	13	60·7	26·3	14·8
,, ,, 11	14	52·9	33·1	12·1
,, ,, 12	14	53·9	32·1	12·5
,, ,, 19	13	56·2	30·8	1 6
,, ,, 20	14	56·5	29·5	3·2
,, ,, 21	13	59·6	27·4	3·7
,, ,, 22	13	57·2	29·8	3·1

Wood as a Substitute for Coal.

In regard to the use of wood as a partial substitute for coal, the author pointed out that several works in districts where a supply of timber was obtainable had experimented with its use. He referred at the same time to the fact that the use of wood for the manufacture of lighting gas had been adopted long ago in Switzerland and Bavaria; the products being known as "Pettinkofer" gas. By the carbonization of 100 kilos of dry fir wood in cast-iron retorts, taking a charge of 50 kilos, the yield of highly luminous gas, after purification, was 30 cb.m., equivalent to 10,800 c.ft. per ton. The fir yielded also 20 p.ct. of good wood charcoal, and from 5 to 7 p.ct. of tar. The proportion of carbon dioxide in the crude gas was 25 p.ct. Experiments made on Riché gas had likewise shown that the gas produced by the distillation of wood was suitable for gas-engines.

On several occasions tests had been carried out at the La Villette works—namely, in 1863, 1870, and 1894; the latter with the object of obtaining saleable wood charcoal. For this purpose a low temperature (400° C.) was necessary, and the gas produced had very little lighting power. The process would yield about 25 p.ct. of wood charcoal weighing 25 kilos. per hectolitre (20 lbs. per bushel).

The author then passed in review the attempts which had been made during the past two years to utilize wood as a gas-making material. In the Romarantin works, a considerable proportion (9 to 16 p.ct.) of the gas supplied to consumers had been made from wood. The charges weighed 100 kilos. in the case of fir and 120 kilos. in that of oak; care being taken to limit the use of a

single retort for the distillation of wood to twenty-four hours. Retorts which were used continuously gave rise to trouble in the shape of blocking of the ascension pipes with a viscous mass which was difficult to remove. From 100 kilos. of wood, 25 cb.m. of gas were obtained (9000 c.ft. per ton), together with 1 hectolitre of wood charcoal weighing 15 kilos. in the case of fir and 18 kilos. in that of oak, equivalent to 12 and 14 lbs. per bushel respectively.

In the Bône works, white eucalyptus wood averaging 940 kilos per cb.m. in weight had been used. The wood was cut into pieces not exceeding 6 in. in size. When using ordinary retorts of 3 metres length, the charge was from 130 to 150 kilos (286 to 330 lbs.). The best temperature appeared to be that at which coal distilled in 4 h. 48 min. (five charges per day). With this degree of heat the time of carbonization of the wood varied from 3¾ to 4 hours. At Bône, the yield of gas from 100 kilos of wood was 30 to 31 cb. m. (about 10,800 c.ft. per ton). The calorific power appeared to vary between 3600 and 3800 calories.

If delivered in its pure state, this gas required a readjustment of burners owing to the less quantity of air needed for combustion in comparison with that from coal. If, however, the proportion of wood was not greater than one-quarter of the daily total consumption, the mixed gas appeared to be suitable under existing conditions. Unless complete neutralization took place in the washers, by means of the ammonia produced simultaneously from coal, the gas retained a small proportion of pyroligneous acid. The quantity of tar produced was about 5 p.ct. of the total weight of wood distilled; the tar differing appreciably from that from coal. It was found that the wood should preferably be carbonized in retorts which contained some deposit of carbon; not more than three or four charges being carbonized in succession in the same retort. A further point from the Bône trials was the necessity of ample circulation in the hydraulic main owing to the larger quantity of steam generated from the wood. The wood coke amounted to about 25 p.ct. of the wood distilled; about one-fifth of it being dust. The coke was light and friable.

At the Beaufort works, trial was made some fifteen or twenty years ago of distilling fir. The retorts were charged with a mixture of one part wood and four parts coal; the production of gas being 25 cb.m. per 100 kilos of the mixture (9000 c.ft. per ton). As regards lighting power, the gas developed 1 carcel with a consumption of 120 litres per hour.

At Angers, fir wood has also been carbonized, but after drying in the open air near to the furnaces for a period of six weeks. The loss in weight during this drying was 27·4 p.ct. The charge of dried wood in three retorts of 6 metres length was 590 kilos; the wood being used in bundles consisting of faggots about 3 ft. in length. Carbonization occupied three hours, and yielded a gas averaging about 105 litres for 1 carcel. The yield of gas from a given weight of wood appeared to be about the same as that obtained from coal in the other retorts. The wood coke amounted to 18·64 p.ct. by weight, or 1·10 hectolitres per 100 kilos (30 bushels per ton). This was the yield when quenching the coke with water immediately on removal from the retorts.

At Arcachon, wood of the sea pine was allowed to dry for three or four months in the open air. A charge of 99·3 kilos was introduced into each retort, and carbonization completed in four hours. The yield of gas was 36·4 cb.m. per 100 kilos. (12,900 c.ft. per ton). The wood coke obtained amounted to only 11·64 p.ct., of which about one-third was dust. By distilling two parts of wood and one part of coal, the gas could be burnt without alteration to the burners. By selecting special sections of the pine wood, less gas, of lower quality, was obtained; but the yield of coke was better at 14·4 p.ct. The yield and quality of the gas appeared to increase with the quantity of resin contained in the wood. On the other hand, the yield of coke was less and the proportion of dust in it greater.

Proceeding from these experimental details, to the general question of using wood as a gas-making material, the author laid emphasis upon the fact that wood gas, whatever wood is used, contains an appreciable quantity of acid, although very little sulphur. The proportion of wood which can be used along with coal thus appears to be limited by the condition that the acids shall be neutralized by the ammonia of the coal gas; otherwise corrosion of the works' plant and of the meters used both in the works and by consumers would result.

Another great difficulty is the large proportion of carbon dioxide which the crude gas contains—a feature of it which, under most conditions, will always render it merely an expedient. In certain circumstances, wood could perhaps be turned to good account.

Another point is that the tars produced by the distillation of wood differ appreciably from those of coal, and contain certain constituents which cause trouble to the distillers in the production of marketable products. Works which use wood as a supplement to coal should thus notify the fact to the distillers in making deliveries of tar, as the result of which the distillers would be able to take the necessary precautions.

Other materials which have been pressed into the service of the gas-maker under present-day conditions in France are olive husks (the residue from the extraction of olive oil) and the resinous dross left on the filtration of crude resin. From the first of these materials a yield of 33·5 cb.m. has been obtained from 100 kilos (12,000 c.ft. per ton), together with 24 p.ct. of powdery residue, which, after admixture with tar, can be used under boilers. The proportion of carbonic acid in the crude gas is very high—about 22 p.ct. The resinous residues are found to yield about 65 cb.m. of very luminous gas from 100 kilos. (24,000 c.ft. per ton). A very small amount of residue is left in the retorts.

While expressing the hope that the details collected in his communication would be of service to his colleagues in assisting them to remedy restricted coal supplies, the author pointed out that the use of coal substitutes was a question not only of their cost but of the possibilities of obtaining them and transporting them to the works.

Utilizing Natural Lignites.

The third class of material which our French friends have sought to utilize are the natural lignites, the results with which in distillation vary very widely according to the source of the substance. These variations extend as much to the yield of gas and its quality as to the amount of ash and the proportion of sulphur in the residue.

Owing to the powdery nature of the residue, it has been found practicable to carry out the distillation of lignite only in plant such as that of Woodall-Duckham, with which the residue can be removed at a temperature sufficiently low to preclude danger of its taking fire. On removal from vertical retorts of the Bueb type, the charge is in a state of incandescence, with the result that discharging is a critical process.

Lignite gas contains much sulphur and carbonic acid; and thus a limit is set to the proportion of lignite which can be used. Up to 15 p.ct., a mixture of lignite gas with that of coal is found not to present difficulties in purification or consumption.

Attempts have been made at the Pau works to employ small quantities of Laluque lignite. Although the percentage of sulphur is high, it has been found possible to use 15 p.ct. of this lignite in admixture with ordinary coal. This can be done without appreciably injurious effect upon the appearance and quality of the coke. With a mixture containing 10 p.ct. lignite, the coke resembles that from coal; with 20 p.ct. the coke is still of presentable appearance; with 33 p.ct. the appearance is not bad, but the coke is very friable and contains an undue proportion of dust.

A mixture of 800 kilos of lignite and 550 kilos of coke, used as the fuel for a furnace distilling 6000 kilos of coal per twenty-four hours, was found to yield results quite as satisfactory as those with coke only.

The author concludes that, as in the case of peat and wood, the nearness of a gas-works to deposits of lignite is the factor which chiefly influences the possibility of employing this material.

FUTURE LINES OF ADVANCE IN COKING PRACTICE.

By George E. Foxwell.

[A Paper read before the Yorkshire Section of the Society of Chemical Industry and reprinted from their "Journal," May 31.]

In this paper the author's intention is to bring forward some of the problems at present awaiting solution in connection with the coking of coal, and to indicate briefly lines on which research might with advantage be undertaken.

The coking industry, like all other branches of chemical industry, is faced with many problems (some of urgent importance, others not immediately vital), most of which will require to be solved in the near future. It will be necessary to speed-up considerably, to shorten the carbonizing period in order to increase the output. In this country probably no coke-ovens, even those working with low-volatile coal, are carbonizing consistently in less than 24 hours. In America quite different conditions prevail. The carbonizing period is much shorter, and larger ovens are in use. To cite an actual instance: At an installation of 560 Koppers ovens at Gary, U.S.A., each oven has a capacity of 12¾ tons of coal per charge, and the charge is burnt off in 16½ hours. The coal contains 18 p.ct. of volatile matter and yields 12,200 c.ft. of gas per ton. Just under 4 gallons of tar and 18 lbs. of sulphate of ammonia are also produced per ton of coal carbonized. Such coal in an English oven would probably produce 10,000 c.ft. of gas, 5 to 6 gallons of tar, and 20 lbs. of sulphate of ammonia, and would take 26 hours to burn off. Moreover, very few English ovens take a charge of more than 10 tons of coal, and in most cases only 8 tons. The secret of the quick-burning American oven is said to be that the walls are made of brick containing 95 p.ct. of silica; and this, owing to its higher fusing point, enables the ovens to be worked at a much higher temperature. In England, on the other hand, brick containing 80 p.ct. of silica is generally used.

The Refractories Used.

A great deal of work is required in connection with refractory materials, both in connection with their manufacture and use. The ideal brick for coke-oven walls should be hard, in order not to break in transit or wear away when pushing-out the coke. It should be a thoroughly good conductor of heat; the expansion and contraction should be under 1 p.ct.; and the tendency for the brick to crack on cooling should be as small as possible. The brick should also be resistant against chemical action, as coke-oven walls in some districts are subjected to serious corrosion, owing, it is supposed, to the action of the soluble salts (particularly sodium chloride) contained in the coal.

Coke-oven bricks are at present far from being satisfactory. As supplied by different makers, they are of very uneven quality —some being very friable, others offering considerable resistance to the passage of heat, others again cracking badly on cooling from a high temperature, while none resist corrosion. Here lies an exceedingly wide field for research.

Mixing of Coal.

Another point of difference between English and American practice lies in the scientific mixing of coals before coking. English coking plants are usually (though by no means always) built at a colliery. The slack coal from all the different pits is sent to the ovens; and, as long as a good quality of coke is produced, no further attention is paid. Certain coals do not yield a saleable coke when carbonized alone; and these are not sent to the coking plants. It so happens that, generally speaking, coals yielding a poor quality of coke give a higher yield of bye-products than coals yielding good coke. If scientific blending were to be carried out, much of our non-coking coal could be used in the coke-oven, and the yield of bye-products increased without materially affecting the quality of the coke. In American practice, the plant is worked for some days on a known mixture of certain coals, and the results noted. The proportions are then changed, and a test again carried out. By proceeding in this way, the best mixture for the purpose is found, and is then rigidly adhered to.

Quenching of the Coke.

Another point worthy of serious attention is the quenching of the coke. As the coke is issuing red-hot from the oven, it passes through a spray of water; and the quenching is then finished by hand spraying. Unless the quencher is highly experienced, the coke will contain either too much or too little water. In the former case there is trouble with the buyer; in the latter case the railway wagons are apt to be burnt. It is also difficult to quench coke properly by night; since coke which appears to be perfectly quenched by day may appear red-hot by night. The adoption of some form of mechanical quencher would be a valuable improvement. In one appliance of this sort, the hot coke falls into an iron basket, and is thence conveyed to a trough, where it is immersed in water for a definite time and then withdrawn. It is said to be possible to reduce the water content to under 1 p.ct. regularly by this means.

Breeze Used.

The utilization of coke breeze should be developed. At present the greater portion of this material finds its way to the colliery refuse heap. From 3 to 8 p.ct. of the total coke is usually produced as breeze—the proportion depending on how the coke is handled. According to the Home Office "Report on Mines and Quarries" for 1915, the total quantity of coke produced at coke-ovens was 11,908,940 tons. If the breeze produced is taken at 5 p.ct. this amounts to 595,500 tons. From the point of view of fuel economy it is essential that this should be utilized either for briquette making or some other purpose. If briquettes were to be manufactured from the whole of this, it would incidentally provide an outlet for some 40,000 tons of pitch annually.

Recovery of Bye-Products.

Apart from improvements in the coking process, very great advances are capable of being made in connection with the recovery of bye-products. The recovery should start before the coking process. Large quantities of iron pyrites are washed out of the coal; and these should be recovered, partly for the value of the iron, but more especially for the sulphur. No effort whatever is made to recover these. In most instances the whole of the output from a colliery passes through the washery, and large quantities of carbonaceous shale, containing a good deal of coal. are produced. Doubtless in many instances the shale is too high in mineral matter and too low in pyrites to make it worth treating; but with improved methods a great deal of sulphur could be recovered from this source.

The author does not profess to have gone very deeply into this particular question; but as a tentative suggestion he would put forward the following two methods.

(1) The washery refuse is treated in a specially designed producer of the Mond type. The producer gas, containing sulphuretted hydrogen, sulphur dioxide, and ammonia, is passed into the main conveying the crude coal gas from the ovens, and is treated for the simultaneous recovery of ammonium sulphate and sulphur by the Feld "polythionate" process. This process will be referred to later. The advantage of this method would be that a large proportion of the nitrogen contained in the washery refuse would be recovered as ammonia. The diminution in the quality of the gas for heating the ovens would not be of any importance, since at least one battery of coke-ovens in this country is heated by Mond gas having a calorific value of 140 B.Th.U. per c.ft.; and on the Continent blast-furnace gas of 105 B.Th.U. per c.ft. is used in some places.

(2) The second method consists in passing coke-oven gas, after the extraction of the products, over the carbonaceous shale and pyrites, heated to a suitable temperature by means of the surplus gas. The result would be the formation of sulphuretted hydrogen, sulphur, and metallic iron. The sulphuretted hydrogen would be recovered by oxide-of-iron purifiers. In either case the residue, if it contained sufficient iron, could be sent to the blast-furnaces. Laboratory tests with the second method have given very encouraging results.

All coals give off sulphuretted hydrogen on carbonization. The amount varies from 0·03 to 0·7 p.ct. by weight of coal carbonized; the figure usually being between 0·2 and 0·4 p.ct. In many instances the amount of this is such that, if converted into sulphuric acid, it would provide sufficient acid for the manufacture of sulphate of ammonia from the whole of the ammonia evolved. If sulphur were recovered from the pyrites as referred to above, every coal would yield sufficient for this purpose. In very few instances is anything done to utilize this sulphur.

A method is wanted which would enable the ammonia to be recovered as sulphate, using the sulphur contained in the coal to provide the necessary sulphuric acid. Not one of the methods at present suggested for doing this has come into general application. The most obvious method is to extract the sulphur from the gas by means of iron oxide, convert the sulphur extracted into sulphuric acid by the well-known lead chamber process, and use the sulphuric acid to extract the ammonia from the gas in the usual way. This process is not adapted to any but the largest works, owing to the small amount of sulphuric acid required. A forty-oven plant will use about of 15 to 20 tons of 142° Tw. B.O.V. a week. The author is informed that it does not pay to put down a sulphuric acid plant for less than 30 tons of acid a week.

Two other processes have been devised and worked-out on a practical scale; but neither has come into anything like general use. The object of each of these is to avoid the necessity for manufacturing sulphuric acid in an independent plant. Future advance will almost certainly lie along these lines.

The Burkheiser process consists in extracting the sulphur from the gas by oxide of iron, burning this to sulphur dioxide, and introducing the latter into the gas-main. The resulting salt is a mixture of sulphite and sulphate. This is the weak point; since, contrary to expectation, it was found very difficult to convert the sulphite to sulphate by atmospheric oxidation.

The Feld process, which has found some application on the Continent, consists of treating the crude gas containing ammonia and sulphuretted hydrogen with sulphur dioxide in presence of free sulphur. The recovered ammonia is thus first converted into thiosulphate, and then into polythionate, which is finally oxidized to sulphate, with liberation of sulphur.

The whole problem bristles with difficulties; and the inventor of a simple commercial process for doing this would find himself amply rewarded.

Recovery of Ammonia.

The present method of recovering ammonia is by no means the best or the most rational; and much work remains to be done on this. In the first place, the system of recovering the whole of the ammonia as sulphate seems irrational. A large portion of the chlorine contained in coal is liberated on carbonization in the form of hydrochloric acid—the amount depending on the state of combination of the chlorine, the temperature of the coke-oven, and the duration of heating. As soon as the temperature in the mains is low enough, this combines with the ammonia and forms ammonium chloride. Under the present system, this is decomposed by milk-of-lime, and converted into a less valuable compound—that is, ammonium sulphate.

In places where the chlorine content of the coal is sufficiently high, any ammonium chloride formed should be recovered as such. The author has done some work on this subject, and recommends the following method: The gas while still hot (about 100° to 130° C.), is scrubbed with a spray of water at 70° C. The water is used over and over again until nearly saturated. The solution is then concentrated further by evaporation, and allowed to crystallize—any evolved gases being led into the gas-main. The mother liquor is diluted with water, and again used for washing the gas. If care is taken that the tar is properly separated from the liquor, and if only a moderate quantity of crystals is obtained at each evaporation, a reasonably pure product may be manufactured without any necessity for recrystallization. When the accumulation of other salts in the liquor gets so great that the chloride is contaminated, the liquor is sold to some works having a lime-still, and the cycle of operations recommenced with fresh water.

In an actual experiment conducted on a works' scale, the liquor obtained had the following composition:

	Grms. per 100 c.c
Ammonium carbonate	0·22
,, sulphide	traces
,, cyanide	traces
,, sulphate	0·10
,, ferrocyanide	*nil*
,, chlorine	9·52

Without doubt, the ammonium chloride content could have been raised to three times this amount by longer circulation. On evaporating a portion of it in the laboratory, the chloride obtained had the following composition:

	Salt Obtained.	Theoretical.
Ammonia as NH_3	30·80	31·85
Chlorine as HCl	67·89	68·15

The salt was of a grayish-white colour.

The recovery of ammonia as chloride is practised in a few works; but there is no reason why it should not be adapted to every existing plant. The recovery of the hydrochloric acid

evolved in the distillation of coal could in this way be easily and completely effected, and at the same time yield much profit.

RECOVERY OF TAR AND AMMONIA.

In the author's opinion, the recovery of the tar and ammonia from coal will ultimately take place somewhat on the following lines: The hot gas from the ovens will be allowed to cool to a temperature of (say) 120° C., and will then be sprayed with hot water at 70° C. This will extract ammonium chloride and the tar fog. The author finds from practical experience that it is necessary to provide means whereby the gas entering the chloride extractor may be either warmed or cooled in order that the temperature may be under complete control. After spraying with hot water to recover ammonium chloride, the gas containing sulphuretted hydrogen and ammonia will pass on to an apparatus where sulphate of ammonia will be recovered direct. As has been mentioned before, one of the most promising lines of research is the discovery of some economical process which will effect this.

NAPHTHALENE.

Another compound which has been neglected is naphthalene. The market for this product is growing, and will increase even more in the future with the development of internal combustion engines using it as fuel. At some direct-recovery plants, there has been trouble owing to naphthalene blocking-up the mains, which has necessitated the installation of naphthalene recovery apparatus. The method has been to spray with cold water the hot gas leaving the saturator—a treatment not possible with any other type of plant, as the essential feature is sudden cooling. In other types of plant the naphthalene is absorbed by creosote oil when extracting benzol. In order to recover the naphthalene, another fraction is taken after the benzol has been driven off from the creosote oil by distillation; and this is allowed to cool in pans, and the naphthalene fished out. The original intention of this process was to prolong the life of the benzol scrubbing oil by preventing it from becoming unduly viscous; and as far as this is concerned, it has succeeded admirably. As a process for recovering naphthalene, however, it is very inefficient. Only a small proportion of the naphthalene taken up by the oil is recovered in the fraction distilled; and it would not be economical to distil to (say) 230° C. simply in order to recover naphthalene. The oil takes up more and more naphthalene, until a point is reached when it is in equilibrium with the gas. It is clear from a consideration of the physico-chemical factors involved that the naphthalene absorption must be very inefficient. A process is wanted for carrying this out on more efficient lines.

TREATMENT OF BENZOL.

The method of washing the crude benzol is open to improvement. At present the benzol is washed first with 5 to 8 p.ct. of its volume of sulphuric acid (D.O.V.) in two washings; then with water; followed by caustic soda and more water. This takes considerable time, and attempts are being made to do the washing of benzol continuously. In one such plant the benzol vapours from the still are passed through hot acid and caustic soda. In another plant the liquid falls down a series of tubes, in which it is treated with the washing reagents. Whether either of these processes will prove commercially workable has yet to be seen. Some system of continuous washing is, however, desirable.

No attempt is made to recover the phenol, pyridine, or thiophene washed out of the benzol; and in view of the large quantity of benzol dealt with on coke-oven plants, this would be a useful step forward. Under present conditions of working it would probably not pay. The phenol content of 65 p.ct. benzol is usually under 2 p.ct. Much of the pyridine present in the gas is taken out by sulphuric acid in the saturator; and until new uses are found for thiophene it will not be worth recovering on coke-oven plants. The recovery and utilization of these substances is a matter for research.

The present system of recovering 65 p.ct. benzol is not the one calculated to give the best results. It is found in practice that by manufacturing benzol of 55 p.ct. strength, there is a very considerable increase in the amount of toluene recovered. It seems, therefore, preferable to recover benzol of much lower strength than is the case at present, and to wash this for phenol. Occasionally the creosote oil should be distilled up to (say) 210° C., and the half-spent caustic soda which has been used for washing the benzol used for the first washing of this creosote fraction. In this way, it may be found possible to recover considerable quantities of phenol. With the price of 60's carbolic at 3s. 4d. per gallon, this should be well worth considering.

It would be very advantageous if a system could be found whereby the carbon bisulphide could be recovered from the gas before taking out the benzol. Carbon bisulphide is not usually recovered on coke-oven plants, being regarded merely as an objectionable nuisance. This is not easy to understand, as a good price is obtainable for it. Benzol will frequently contain 5 p.ct. of this compound.

In all probability the coke-oven plant of the future will not stop at the recovery of crude 65 p.ct. benzol or washed 90 p.ct. benzol. It will manufacture pure benzene, toluene, and xylene, and probably also nitrobenzene, nitrotoluene, aniline, toluidine, and possibly pure naphthalene, together with α- and β-naphthol. The manufacture of the raw materials for dyes would be more rationally carried out on coking plants than at the dye-works; and it would leave the manufacturers of dyes more opportunity to concentrate on the production of colours if coke-oven plants would undertake the manufacture of these raw materials.

A necessary step before this ideal can be reached is the training of qualified men capable of taking charge of such works, and coke-oven managers and chemists must be more highly trained in the future than they have been in the past.

UTILIZATION OF SURPLUS GAS.

The utilization of the surplus gas from regenerative coke-ovens is a matter which is now receiving considerable attention. The author recently pointed out that the surplus gas evolved from bye-product regenerative coke-ovens is equivalent to over one million tons of coal per annum. In a great number of cases this gas is allowed to burn at a blow-off pipe, in order to get rid of it. It would be possible to transfer this gas to neighbouring towns by means of high-pressure mains, as is done in the case of natural gas in the United States. There is, of course, also the possibility of using it in gas-engines to generate electricity, which could then be distributed over a large area. It also seems possible that the mixture of unsaturated hydrocarbons, methane, and hydrogen in the gas may be found capable of being transformed into valuable products either by chemical or physical means.

ADDENDUM.

With reference to the possibility of using coal gas for the synthetic production of valuable compounds, alluded to in the last paragraph, reference may be made to the paper entitled "The Production of the Lower Chlorides of Methane from Natural Gas," printed in the "Journal of Industrial and Engineering Chemistry," 1916, pp. 1090 94. By subjecting a mixture of chlorine and natural gas, in a chamber containing blocks of ice, to the action of light from the white flame electric arc, a heavy liquid was obtained beneath the water produced by the melted ice. This liquid consisted of methylene chloride, 35 p.ct.; chloroform, 35 p.ct.; carbon tetrachloride, 5 p.ct.; chloro-ethanes, 20 p.ct. A portion of the product, amounting to about 14 p.ct. of the total, remained soluble in the water, and consisted of methylene chloride, 61 p.ct.; chloroform, 28 p.ct.; carbon tetrachloride, 1·5 p.ct.; and chloro-ethanes, 6 p.ct. A quantity of 250 c.ft. of the natural gas yielded several gallons of the mixed chlorides.

DISCUSSION.

The CHAIRMAN (Prof. J. W. Cobb) welcomed the references made in the paper to problems awaiting solution which might guide research chemists who were wanting to give their science a technical application. The importance of refractory materials to the carbonizing industries was coming to receive recognition; and a laboratory for this study was being specially staffed and equipped at the University of Leeds in connection with the Department of Coal Gas and Fuel Industries. The wide differences in properties between the ordinary silica brick and vitrified silica was a simple example of how much depended on other things than chemical composition and how much work lay before them. The author's reference to the use of the sulphur contained in coal as the source of the sulphur in ammonium sulphate called attention to one of the most important questions.

Mr. C. P. FINN remarked that the processes of carbonizing coal for town gas on the one hand and for the production of metallurgical coke on the other had much in common, and that any advance in either branch of the industry had its influence on the other. This being the case, he thought that the success of the modern continuous or semi-continuous vertical gas-retort should stimulate coke-oven constructors to produce a similar type of plant, with a sealed inlet for the coal and the utilization to the full of the heat of the discharging coke—thus placing at the user's disposal a dry product. He knew that there were objections—viz., the absence of a "rest period," and the difficulty of charging compressed coal; but in his opinion these were not insuperable obstacles. Concerning the recovery of bye-products, he drew attention to the methods proposed by Feld, Purves, and others for the fractional separation of tar products within the condensing and washing system. Referring to ammonia recovery, he was pleased to hear that Prof. Cobb's recovery process would soon be working on the large scale with Mond gas. The possibilities of the competition of synthetic ammonia processes, backed by large Continental syndicates, should stimulate research to obtain greater yields of ammonia from coal. The bye-product coke-oven plant of to-day was no longer a mere adjunct to a colliery, as was the old bee-hve oven, but a complex chemical works using a raw material of unknown constitution. It was quite outside the scope of the average colliery manager and engineer, and required for its control men who combined a sound scientific training and the general experience gained only in a works. Such a man must not be a mere "handler of men," but able to direct his assistant staff in the prosecution of works research into the problems that arise from time to time. He was optimistic as to the further development of chemical manufacture on coking plants, as probably no other industry had at hand such sources of power and cheap, clean, and high-quality fuel.

Mr. W. M'D. MACKEY said that the author had mentioned many important points in connection with bye-product coke-oven practice, some of which had already engaged the serious attention of chemists. He had said nothing about low-temperature carbonization, and this he (Mr. Mackey) thought was likely to prove a very fruitful field of research in the future. A low-temperature coke for domestic use would soon be on the market in quantity; and he understood that it was only because of difficulties raised by the war that it was not already on the market. He considered that the solution of the difficulty of smoky atmospheres in towns would be largely solved by the provision of a soft coke, clean to handle, and containing sufficient volatile matter to burn readily. He was doubtful if the recovery of sulphur from colliery refuse would be profitable. The mere handling of material with comparatively little sulphur in it was in itself a serious difficulty. As to coke breeze, his experience did not agree with that of the author—viz., that it was difficult to market; and certainly he did not know of its being put on the

dump. He was dubious as to the advantages of automatic quenchers. High-pressure water under the direction of an intelligent workman he considered better. The point was to water so as to leave the coke warm enough to drive off the water remaining from the quenching, though in practice they might expect about 1·5 p.ct. of moisture in well-quenched bye-product coke.

Dr. L. GORDON PAUL asked how it was suggested to recover the carbon bisulphide.

Mr. HARMER said that the carbon bisulphide was usually recovered by fractionation from the crude benzol, and that much could be done by fractional separation at low temperatures.

Mr. FOXWELL (in reply) said that, as the Chairman had pointed out, the physical properties of the silica brick were very interesting. Quartz on heating changed into other crystalline forms, and about 80 p.ct. of the free silica in a brick consisted of crystobalite. He suggested that, in connection with salt corrosion, it might be that only one of these crystalline forms was attacked. He had purposely not mentioned the fractional condensation of tar, as this would require a complicated plant and highly skilled supervision. It seemed more economical to proceed as is done to-day. With regard to the vertical oven, he remembered that in the early days of vertical retorts great trouble was experienced in connection with the refractory materials of which they were constructed. Probably similar trouble would be met with in connection with vertical coke-ovens; and work on refractory materials must precede any successful attempt in this direction. The vertical oven would possibly be a sound proposition for uncompressed coals, but what of coals which required compressing? He was not in favour of low-temperature carbonization, since the tar produced, being mainly paraffinoid, would only be of use for fuel, and, moreover, the yield of sulphate of ammonia was very low as compared with that from the high-temperature process. The consequence was that the solid fuel produced (intended for household consumption) would have to be sold at a price higher than that of coal if the process was to be a financial success. It was certainly his experience that coke breeze—by which he meant coke passing through, say, a 1 cm. mesh—was thrown away. Published figures dealing with a plant at an English gas-works had shown that it was possible to run a coke-breeze briquetting plant at a good profit. American coals, generally speaking, required more heat for their carbonization than English coals.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Institution Matters.

SIR,—It is not my intention to discuss generally the comments in regard to my address (which I trust will be very full and free) till after the correspondence which I hope will take place through the medium of the "JOURNAL" is at an end; and then I would like to have an opportunity of replying as a whole. But I do want to stop the erroneous impression which may be created by your comment, and which I fear will do much harm unless it is corrected immediately.

In your article "Organization, Deficiency, and Construction," after expressing your opinion that the Institution should remain a purely technical organization, you proceed to say: "But Mr. Broadberry goes further. He would have secretaries and chief inspectors join the Institution as associates; and a special class might be formed for directors and committeemen." So far, so good; but you go on to say: "We do not think that directors and committeemen and secretaries would be satisfied with being penned-off in this manner. They would desire equality, and they would certainly want interesting. Let us briefly examine the President's idea from the point of view of the administrators. Thinks anyone seriously that the administrators of gas undertakings—the controllers of the industry's finance, the men who have the right of veto in all matters of policy, the men who are, in fact, the heads of the industry—will see any fitness in occupying a subordinate place in any organization in which their own executive officers take precedence of them?"

With this distortion of my suggestion, I must absolutely fall foul. What I said in my address was: "There should also be some special provision in some cognate class of members for such men as directors and committeemen who devote their time and energy to the benefit of the industry, and who in so many cases are of such importance that we can ill-afford to be without them." Can it be possible that you understand the word "cognate" to mean an inferiority? If so, I will give you my understanding of the word, taken from Blackie & Sons Dictionary:

> "Cognate (L. *cognatus*—prefix 'co' for 'con' with and gnatus, old form of natus born; natal) born or produced of the same stock, family, or kind, sprung from the same source, akin, allied, related in origin, of similar nature, n. one connected with another by ties of kindred, in law, a relation connected by the mother's side; anything related to another by origin or nature."

My idea is not that there should be any inferiority; and I trust you will see your way to correct the wrong impression your comments would give.

A. E. BROADBERRY.

Tottenham, June 14, 1917.

[We are glad Mr. Broadberry has written this letter, though the pleasure would have been increased had the word "distortion" been omitted. Let us extend the quotation from his address, to show where the blame lies for any misinterpretation of his meaning. He said: "Others there are who are entirely interested in the industry's welfare—such as the secretaries and the chief inspectors, who would probably gladly join the Institution as *associates*, and increase our very short list, which at present consists of two. There should also be some special provision in *some cognate class of members* for such men as directors and committeemen who devote their time and energy to the benefit of the industry, and who in so many cases are of such importance that we can ill-afford to be without them. The *student class* I shall refer to at a later stage, when referring to the question of education." We have purposely italicized certain words in the quotation. It will be remarked from this that the allusion to "some cognate class of members" comes immediately after the reference to "associates," and just before mention of the "student class." Need any other justification be made for our reading of the President's meaning? Examining the words in the light of the construction placed upon them in the present letter, and without reference to the context, we take it that "special provision in some cognate class" means in a class independent of the ordinary membership. If it was intended there should be no difference between the two classes, and administrators were to have equality of power with the ordinary members, then why make "special provision" for them? We do not think, from whatever standpoint the matter is viewed, that Mr. Broadberry had in mind equality in all respects. Therefore if there is not equality, there must be inferiority of either the ordinary membership or the "special provision." Which is it?—ED. G.J.]

SIR,—I have read with great interest your editorial remarks, under the headings of "Organization, Deficiency, and Reconstuction" and "The Muddled Building Scheme." You will, I trust, forgive me for saying that while I am in cordial agreement with the majority of the views expressed by you, I would like to indicate a few points which have occurred to me which, while they do not correspond in every way with your views, are put forward in order to contribute something to the pool of ideas, and so help in the effort to arrive at a common understanding.

It was my privilege to be present last week at the meeting of the National Gas Council and at the annual meeting of the Institution of Gas Engineers; and although I cannot claim in any way to speak for the Society of British Gas Industries, I feel sure the position of this body and its constituent members has some bearing both on the question of reorganization and of housing. And I think that some indication should be given by the other organized bodies of the gas industry as to whether the "S.B.G.I." should or should not be admitted to full membership or partnership on equal terms.

I feel sure that there is no wish on the part of members of the "S.B.G.I." to seek privileges to which they are not entitled; nor if these privileges were granted would they wish to exercise them if their action in doing so were not welcomed by the other interests, especially by those who, as you point out, are "the controllers of the industry's finance, the men who have the right to veto in all matters of policy, the men who are, in fact, the heads of the industry."

With this preface, I would like to put on record an idea which I have been turning over in my mind for some time, and which was brought to a head on learning of the wise decision of the Institution of Gas Engineers to seek a President outside the ranks of its own members.

This policy, as you know, has always been adopted by the Society of British Gas Industries; and I am anxious to suggest that the adoption of a further principle which has been one of the chief reasons for the success of the Society of British Gas Industries might also be considered by the gas industry as a whole. It is the formation of a body in which any interest connected with the gas industry should have a proportionate representation—taking into consideration the relative importance and capital of the interests involved. In other words, I would suggest the formation of a "Gas Institution," the Council of which body would deal with broad questions of principle.

The functions of such a Gas Institution could be decentralized by forming "Sections," each of which, while having complete autonomy as regards matters concerning only itself, would refer questions of importance to the Central Council, or, if it desired, could work in co-operation with any or all of the other sections composing the main body—*e.g.*, Section I. of the new body might be the Institution of Gas Engineers; Section II. might be the British Commercial Gas Association, dealing with commercial affairs; Section III. might be the Gas Companies' Protection Association, whose primary object is, I believe, to look after the interests of shareholders; Section IV. might consist of the present London Coke Committee, whose operations might with advantage, I think, be extended to cover the whole country, to increase the sales of this important smokeless fuel; Section V. might be a Commercial Section dealing with the work now being done largely by the Commercial Sections of the District Associations; Section VI. might be the present Society of British Gas Industries.

A further section could deal with co-partnership and labour, as the gas industry above all other industries is desirous of seeing that labour has full opportunities. In view of future relations with labour, I can see many advantages in admitting representative employees to membership of this Section.

There might also be room for a section to deal with questions of research—such as those mentioned in your issue of April 11, 1916. This section would seem to be called for at the present time, as the funds which are now provided for research work for the benefit of the gas industry come from the Institution of Gas Engineers. Research work which is of value to the whole industry should be paid for by the whole industry, and not by the subscriptions of individual members of one section of it, however important that section may be.

The list of sections could be further extended if thought desirable, so as to include all the interests referred to by the President of the Institution of Gas Engineers in his address. For example, sections might be formed for secretaries, chief inspectors, and any other class who could establish a claim for a separate section.

The various sections would elect their proper proportion of repre-

sentatives on a Central Council. To these representatives could be added elective members, whose standing in the gas industry is such as to make it necessary that they should be on the Central Council without election from an individual section; and this would have the further advantage of ensuring continuity of policy.

These ideas have been developed from experience which has been gained of the working of the Society of British Gas Industries, the interests of the members of which body being as divergent as any other interests connected with the gas industry as a whole.

To an outside observer there would appear at the present time to be a distinct element of competition as to which existing organization occupies the premier position. The National Gas Council is the latest body formed, although it is not yet clear whether it is an *ad hoc* body formed to deal with temporary war conditions only, and it should be remembered that at the present time it is entirely dependent on doles from its four constituent bodies—one of which, although subscribing an equal amount, does not appear to be altogether an acceptable member. If the new Institution could co-ordinate the work of all the present organizations, it would seem fitting that they should receive the whole of the money at present subscribed to the various bodies for propaganda and research work, while it would probably be able to raise very much larger sums for allocation to these purposes.

I trust the above suggestions may be considered on their merits, as they are put forward as a sincere contribution towards the welfare of one of the greatest industries in this country, in view of the difficult times which it will have to face not only while the war lasts but on its conclusion. If these differing interests can be reconciled in this or in any other way, I think the housing scheme—which, after all, is subordinate to the question of reorganization—would follow as a matter of course.

While as a whole the gas industry needs co-ordinating, it would appear that a certain amount of decentralization is advisable, and even necessary, to enable every individual, however humble his capacity, to take his full share in the industry. Provision in any scheme should be made for co-ordinating with a central body the valuable work done by the District Associations and their Commercial Sections, by referring to them any point arising in connection with the work of any section of the gas industry in which local information is desirable. It would appear that the value of these District Associations to members situated some distance from London is very considerable, and perhaps of more immediate value than the membership of any bigger body with headquarters in the Metropolis.

In conclusion, is it fitting to suggest that a recent example might be copied, and that a "convention" be set up—partly nominated and partly elected by all interests—to discuss a constitution for the great industry of gas and smokeless fuel under an independent chairman?

Gothic Works, Upper Edmonton, THOMAS GLOVER.
June 14, 1917.

SIR,—May I congratulate you on the leader in the last "JOURNAL," under the heading of "Organization, Deficiency, and Reconstruction," and also the President for last year of the Institution of Gas Engineers upon his courage in suggesting that, as a Society, it appears to be somewhat of a failure? Personally, I feel that if the gas engineering industry is to achieve its true position in this country, it can only be established by plain speaking, such as your article suggests, and the sweeping away of old-established shibboleths.

This protracted war has enabled us to realize how much that we in the old days considered indispensable is now a matter of small moment, and in reality a menace to the future; and I hope you will keep your new "flag flying" until it is unfurled over a suitable building in which all our various energies will be united.

I am not, nor ever have been, a member of any of the recognized societies of the gas industry; yet for many years I have been in close touch with most of them, and in sympathy with their progress. If I may express an opinion, it would be that, so far as the Institution of Gas Engineers is concerned, for the past six or eight years we have been drifting. If we are to move with the times, we must bring into active work men who have the industry at heart, rather than the individual or local interest.

To do this the industry must be under the control of men with a future before them, and who are in touch with our moving times. Like our Army and Navy, we must clear out the old Generals, and allow them to take an honourable position, which is their due reward. But they should merely remain to encourage, and "when requested" advise, the younger men. Successful as the "B.C.G.A." has been, its success as a separate entity weakens the industry; and although its official staff is represented throughout the country, yet it appears to be essentially a London-controlled body having a national outlook. I am sure this will be considered heresy; but it is time the industry, without which the defence of our country would have been impossible, should attain its correct position in our national life. Is it not degrading that we should have to meet within buildings erected and owned by other engineering societies, who may or may not be as important as our own? I think you will agree that it is.

Personally, I think a Committee or Council should be formed, where our united interests—apart from individual and local—might be brought together; it being understood that the societies represented pay the expenses of their delegates, so as to ensure the best men, independent of other considerations. The Committee might be formed by two members each from the Institution of Gas Engineers, the "B.C.G.A," the "S.B.G.I.," the coke-oven industry, tar distillers, collieries, and three Past-Presidents of the District Junior Associations (one from Scotland and two from England), to formulate some general scheme to embrace all our efforts, and secure a suitable building in which we could all meet and concentrate our energies. Wherever the various meetings might be held, there should be a building for continuity of work.

It is a true saying that "fools rush in where angels fear to tread;" but I hope an abler pen than mine will take up this matter, and that you will continue your efforts in this direction. "SPECTATOR."

June 15, 1917.

Gas v. Petrol for Motor Vehicles.

SIR,—The object of our writing you with regard to your article in the issue of the 29th ult., on the running of motor vehicles by means of coal gas, is, firstly, to record our emphatic opinion that you are doing a real public service by drawing attention to a new and important industry, and, secondly, in the hope that such publicity will attract the genius we are now all looking for.

The use of coal gas for running motors has its disadvantages; and there is now presented a magnificent opportunity for the man of brains to overcome them, and so benefit humanity and, incidentally, himself by giving it a cheap form of transit.

We, ourselves, believe that sooner or later, coal gas will be generally used for mechanical traction, and that it is not simply a war-time expedient, for the following reasons:

1. Previous to the war, the Government had practically no road transport using internal combustion engines. They will, however, continue to be extremely large users of petrol; and when the Central Empires come to take their full share, the present high price of petrol will not be appreciably affected for years to come.
2. Gas is obtainable everywhere; and the future motor outfit will include an appliance for taking supplies from any gas bracket or connection.
3. The difference in the prices of petrol and gas after the war will be relatively as now, owing to the fact that the petrol supply is foreign and limited, whereas gas is a home product, and the supply inexhaustible.
4. The engines at present in use require absolutely no adaption in order to use coal gas.

The present difficulty in using gas is the large size of container necessary to hold the gas supply. But improvements are sure to come about, whereby the gas used will be compressed, solidified, liquefied, washed, and purified (this is where the aforesaid man of brains comes in); so that, bulk for bulk, the future gas container will be capable of holding many times the amount of gas energy that the present crude arrangement does.

As soon as more vital questions are settled (perhaps before), there will, of a surety, be a big battle of brains—not between "gas and petrol," as might be inferred from your article, but between gas experts and electric battery manufacturers.

At present, petrol is without doubt the most convenient power factor so far as concentrated energy is concerned; but in view of the disadvantages connected with storage, handling, the limited supplies, the big demand, and the high price, the tendency is for its place to be taken by coal gas or by electric batteries.

Coal gas is now undoubtedly at a disadvantage; but that is simply because the question has not received much attention. One of the minor blessings of the war will be the new form of motor power which will come into existence; and we hope the inventor will soon give the matter the attention it deserves.

FEATHERSTONS (LONDON AGENTS) LIMITED,
per G. T. HUNT, Director.
110, *Victoria Street, S.W.* 1, *June* 13, 1917.

REGISTER OF PATENTS.

Coin-Freed Mechanism for Gas-Meters.
No. 106,294.

COCKEY, F. G., of Woodford Green, Essex, and the GAS METER COMPANY, LTD., of Kingsland Road, N.E.

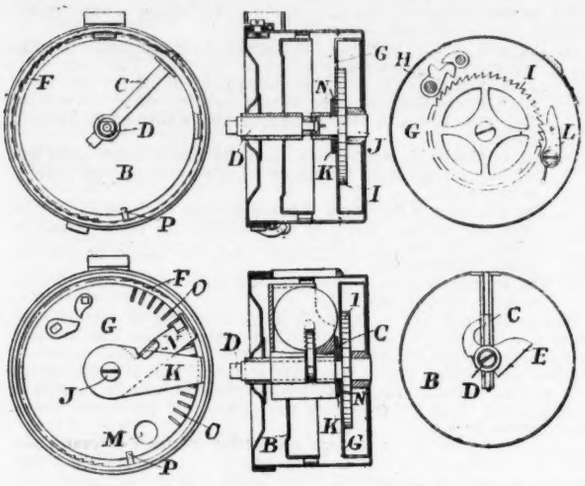
No. 5399; April 12, 1916.

This invention is intended to simplify the construction of coin-freed meters so as to enable most of the parts to be stamped out of sheet metal, and to ensure as far as practicable that it shall be capable of operation only by the insertion of the proper coin, and that not more than the prescribed quantity of gas can be freed by the use of each coin. Further objects are to enable coins which have jammed in the coin-pocket to be ejected, and to provide means for setting the coin-indicator back to zero and shut off the prepayment valve by hand when required.

As shown, the coin-freed mechanism is enclosed in a cylindrical casing attached to the meter above the money-box. Coin inlet and outlet slots are formed in the periphery of the casing and the usual removable end cover with sealing means is fitted for affording access to the interior. The coin-carrier consists of a disc B provided with a radial coin receiving pocket or guide C. The coin-carrier is mounted on, and actuated by, a hand-operated spindle D capable of a limited independent rotary movement in the coin-carrier, and provided with a short arm to bear against, and retain, the coin in the inner end of the pocket when the carrier is rotated to convey it from the inlet to the outlet slot in the casing. This would prevent a smaller coin being used than that for which the apparatus is intended by holding it out of the way of the pawl upon which the coin is intended to act. A cam E is arranged to act on the coin when the carrier is moved in the reverse direction, and tends to force it radially outwards against the casing, so that if the cam be operated when the coin is over the delivery slot in the casing it will eject the coin should it be jammed in the slot or fail to fall out by gravity.

This cam action on the coin may also be utilized to prevent the carrier being rotated backwards until the carrier has completed its angular movement. For this purpose a rack F is provided with which the outer edge of the coin is forced into engagement by the cam E should a premature backward movement of the coin-carrier be attempted. When in position in the coin-pocket of the carrier, and rotated by it, the coin which projects from the pocket C towards or against the face of the price-varying disc G acts on the pawl H carried by the

disc, which serves for coupling it with a ratchet wheel I in the forward direction of rotation of the disc. The ratchet wheel is coupled with the stop mechanism of the meter. It is fixed on a short spindle J mounted at one end to rotate in a bearing in the inner end of the casing of the coin-freed mechanism, and at the other end in a bracket K, being held against rotation by a spring pawl L. On the spindle J the price varying disc G is mounted loosely, but carries a pawl adapted to be forced into engagement with the wheel I by the coin to couple the disc to the wheel, and through the wheel to the stop mechanism, during the forward movement of the coin-carrier, while allowing the disc G to be moved freely backwards by the coin-carrier after each forward stroke of it.



Cockey's (Gas Meter Company) Coin-Freed Gas Meter.

The angular movement of the disc G (which is varied according to the quantity of gas to be delivered for each coin) is adjusted by a stop arm N mounted to turn on the same spindle as the disc, and capable of being engaged in one of a series of peripheral notches in the disc. Both the face and periphery of the price-varying disc (which is flanged) are preferably graduated to indicate the different positions in which the stop arm must be placed for the delivery of different quantities of gas; and in order to facilitate the setting of the arm, a shuttered aperture is provided in the casing, through which the position of the arm can be easily seen.

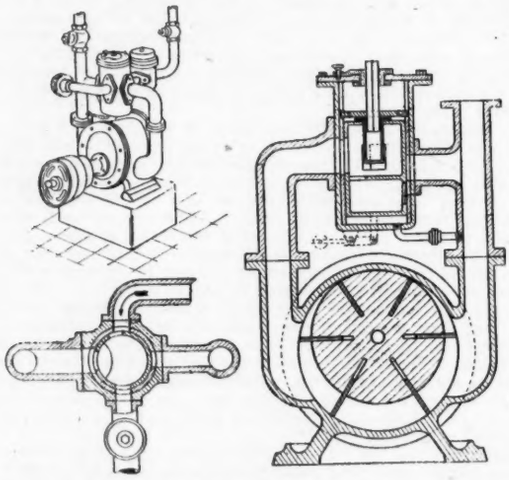
The arm N has a stop which projects into the path of the coin-pocket C and is acted upon by the coin-pocket to return the price disc to the initial position after each forward stroke, where the arm is arrested by the bracket K. In this position the coin-pocket is opposite the coin-slot formed in the periphery of the casing. A fixed stop P is also arranged in the casing to arrest the movement of the coin-carrier when the coin-pocket is over the delivery opening.

Automatic Gas-Regulators.—No. 106,296.

TURNER, E., of Urmston, near Manchester.

No. 5537; April 15, 1916.

The chief objects of this invention are to allow of the mixing ratio of two or more gases, or of the pressure and volume of the mixture in the delivery main, being regulated simply; to allow of a constant pressure being maintained in the delivery main once the regulator is



Turner's Automatic Gas-Regulator.

adjusted; to allow of a constant mixing ratio being preserved between the gases once the ratio has been adjusted; and to allow of the mixing ratio, or the pressure of the mixture, to be readily adjusted, and when adjusted to be preserved independently of the volume of gases passing through the regulator. The regulator is intended chiefly for use in the mixing and regulating of gas and air for heating and lighting purposes.

The action of the regulator (shown) is as follows:

With the casing connected to the gas and air supplies and the mixture outlet coupled to the suction side of a compressor, and also with the delivery main connected by a return branch to the lower part of the regulator casing, the setting in motion of the compressor results in the gas and air being drawn through the piston and compressor in the proportion determined by the ports in the piston. As the pressure rises in the delivery main, part of the mixture leaks through a small hole into the space below the piston; and, should the pressure of the mixture be greater than the weight of the piston, it raises the piston. As the pressure increases, the piston is further raised until the bye-pass ports are uncovered, when, with any further tendency of the pressure to increase, the mixture is bye-passed from the pressure to the suction side of the compressor. With a subsequent fall of pressure in the delivery main, the piston falls and the bye-pass openings gradually close. In this way a constant pressure is maintained in the delivery main; while, further, by reason of the motion of the piston, the ratio of the mixture is maintained for all pressures and volumes.

When an appreciable difference in pressure exists between the incoming gases, the interior of the piston may be divided for a portion of its length into as many chambers as there are inlet ports in the regulator. The chambers will open into a common chamber at the lower end of the piston which is in connection with the suction port of the regulator.

Gas-Cookers.—No. 106,326.

FLORENCE, A. P., of Hanwell, W.

No. 7070; May 17, 1916.

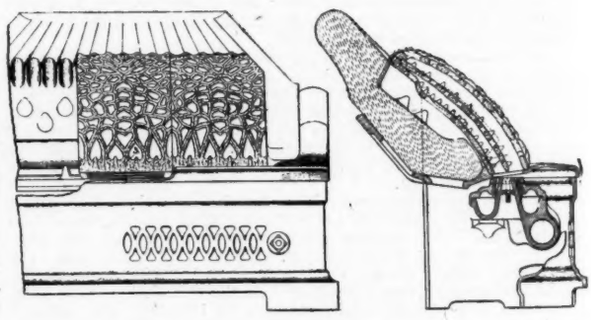
This invention comprises a shallow heating or heat distributing chamber with a top plate formed with apertures for cooking utensils and an apertured bottom plate for admitting hot products of combustion to the chamber. The burner is made to move horizontally in a circular path that is about a vertical axis below the bottom of the chamber and to deliver the hot combustion products into the chamber through an aperture the position of which can be altered to coincide with the burner. Thus by moving the burner about its pivot it gives increased heat at any particular part of the chamber, or below any particular opening in the top plate—at the same time supplying heat through the chamber to any utensils placed over the other openings.

Gas-Fires.—No. 106,361.

PARKINSON STOVE COMPANY, LTD., and HICKINBOTTOM, F., of Birmingham.

No. 10,131; July 19, 1916.

The principal object of this invention is to increase the efficiency of the radiant and to render it suitable for use with burners which provide a narrow ribbon-like flame upon opposite sides of an elongated central air duct—such as described in patent No. 104,976.



Hickinbottom's (Parkinson's Stove Company) Gas-Fire Radiants.

The radiant shown consists of a hollow body of refractory material (made to enclose the flame), preferably of a width equal to that of several ordinary narrow radiants. The lower open end is of substantially rectangular shape; and the body may be slightly curved and inclined in the vertical or placed in an upright position. The front of the body is of any desired pattern; and the back may also be perforated. In order to utilize the inner surfaces of the two ribbon-like flames, a light perforated web or diaphragm of refractory material divides the interior of the radiant in a longitudinal direction—the web passing from side to side and being arranged substantially parallel to the front of the radiant. The interior is thus divided into two passages into which the flames from the burner are directed—playing upon opposite sides of the web, in addition to the front and back walls of the radiant, and "thereby quickly raising the web to a white heat." The web is placed directly over the central air-duct of the burner, and thus "assists the aëration of the flame by inducing a current of air up the duct." The web is provided upon the front face (or both front and back faces) with projections, studs, or nipples arranged opposite to the openings in the radiant. The front surface of the back part of the radiant is also provided with projections arranged opposite to openings in the web, so that radiation of the heat from the projections is not impeded.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Examiners reported that the further Standing Orders applicable to the Sheffield United Gas Light Company's Bill had been complied with. A petition has been deposited by the Sheffield Corporation praying to be heard against the Bill, which was later on read a second time, and committed.

The Haslemere and District Gas Bill was returned from the Commons, with amendments; and the amendments were considered and agreed to.

The Gas Light and Coke Company's Bill was read the third time, with the amendments, passed, and returned to the Commons.

HOUSE OF COMMONS.

Progress of Bills.

The Kenilworth Gas Bill was reported, with amendments.

The Haslemere and District Gas Bill was read the third time, and passed, with amendments.

The Hemel Hempsted Gas Bill and the Lea Bridge District Gas Bill, as amended, were considered, and ordered to be read the third time. This was subsequently done; and the Bills were passed, with amendments.

State Control of the Coal Industry.

Mr. CORY asked the Secretary to the Board of Trade what progress is being made in regard to the financial arrangements for the State control of the coal industry, and when an announcement on the matter might be expected.

Sir A. STANLEY replied that he hoped to be in a position to make an announcement on the subject at an early date.

Federation of British Industries.

Major NEWMAN asked whether, with a view of preventing strikes and labour unrest, he would consider the advisability of ascertaining the views of both the Committee of the Federation of British Industries and the trade unions, and also of creating a representative Committee drawn from both organizations to deal with questions affecting labour, so that if possible any disputes might be settled amicably between them before being investigated by the Government.

Mr. HODGE replied that Conciliation Boards and other machinery for the settlement of disputes exist in a large number of the most important industries of the country, whereby disputes are considered and frequently settled before being reported to the Government Department concerned. The Chief Industrial Commissioner's Department are in constant touch with the trade unions and the employers' associations in connection with the settlement of trade disputes; and the Minister is quite prepared to consider proposals which responsible employers' associations and trade unions may put before him with a view to preventing stoppages of work and the settlement of differences.

Calorific Power Tests at Tottenham.

Major NEWMAN asked the President of the Board of Trade whether, at a conference that recently took place between his Department, the Tottenham Light, Heat, and Power Company, and the local authorities of the districts served by the Company, it was agreed that each local authority might test the gas for calorific power once per day. If so, why, he added, had the Board now made an Order restricting the testing by all the authorities to once per day at each station, without hearing the reasons which the local authorities desired to advance against this course. In view of the disadvantages under which consumers were now placed in the matter of the quality and price of the gas supplied, would the Board give them all the protection possible?

Sir A. STANLEY, in reply, stated that the gas supplied by the Tottenham District Light, Heat, and Power Company may be tested at three separate testing-places; and, in accordance with the uniform practice of Parliament in Local Acts relating to gas undertakings, the Board of Trade, in their recent Order fixing a calorific standard for the gas supplied by the Company, provided that not more than one testing for calorific power should be made at each testing-place on any one day. The Board of Trade do not think that, as a general rule, they are justified in imposing conditions in Orders of this nature more onerous than those imposed by Parliament on other gas undertakers in like circumstances. The representations made by the local authorities in this particular instance were very carefully considered; and the Board saw no reason to depart from the usual practice.

KENILWORTH GAS BILL.

The Unopposed Bills Committee of the House of Commons last Tuesday ordered this Bill to be reported for third reading.

We have already indicated the changes that have been made in the Bill since it was deposited; and in the "JOURNAL" for May 15, p. 301, it was reported that the Bill had been passed by the Unopposed Bills Committee of the House of Lords. One important change, however, was made by the House of Commons Committee in relation to residual products. The clause in the Bill relating to this matter was as follows:

The Company may also—

(*a*) Purchase the residual products arising from the manufacture of gas by other gas undertakers and therewith upon the said lands manufacture other products of the same kind as the Company are manufacturing from their own residual products;

(*b*) Purchase from other gas undertakings and elsewhere and use the materials required to work-up and convert upon the said lands the residual products so arising from their own manufacture of gas or purchased as aforesaid.

But the Company shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings or in the manufacture of which the use of residual products produced by the Company or purchased from other gas undertakings is merely subsidiary.

The Committee insisted upon the model "one third" clause being substituted.

LEGAL INTELLIGENCE.

WILTS COUNTY GASLIGHT AND COKE COMPANY, LTD.

Winding-Up Order Granted.

On Tuesday last, a creditors' petition (presented by Messrs. Cleeves and Co.) for the compulsory winding-up of this Company came before Mr. Justice NEVILLE.

Mr. GALBRAITH said the petitioners had obtained judgment against the Company for goods supplied, to the amount of £89 9s. 7d.; and under execution they had only recovered £45 5s. 7d. The petition was supported by creditors for £293.

Mr. WARD COLDRIDGE, K.C., for shareholders holding £7000 out of the issued capital of £15,000, asked that the petition might be adjourned for a month, in order that they might consider whether they would bring in fresh capital or reconstruct. The Company was perfectly solvent—having money on loan and valuable property and plant.

Mr. GALBRAITH objected to any adjournment, alleging that the Company was not doing any business.

Mr. BEDDALL, for judgment creditors to the amount of £300, supported the petition. He understood it had been proposed to wind-up voluntarily; but his clients preferred a compulsory order.

Mr. COLDRIDGE having read an affidavit in support of an adjournment, in order that the shareholders might consider their position,

His LORDSHIP observed that a winding-up order would not prevent a scheme for reconstruction being carried through. He asked what was the nature of petitioners' debt.

Mr. GALBRAITH: In respect of coal supplied to the Company.

Mr. COLDRIDGE said he was instructed that the Company could put its hand on sufficient capital to liquidate all the debts.

Mr. BEDDALL pointed out that the shareholders represented by Mr. Coldridge had sent in a requisition to the Directors to call a meeting for voluntary liquidation.

Mr. COLDRIDGE: Or to consider whether further capital should be put into the concern.

His LORDSHIP made the usual order for compulsory winding-up.

ENEMY COAL-TAR PATENTS.

Further Application by British Dyes, Ltd.

Applying in the Patents Court for a second batch of German coal-tar dye patents, British Dyes, Ltd., of Huddersfield, included among them two medical patents—No. 13,866 of 1914, and No. 24,652 of 1910. The latter patent is for making "Flavine."

British Dyes, Ltd,, earlier in the year applied for a licence to use 23 German dye patents; their latest application is for 32 other patents. Almost all the dye specifications required have been sent to the Patent Office since the war broke out; so that they represent the newest range of colours. As they have not been sealed and registered as patents because of the war, they are known as "unsealed patents" and vest in the Public Trustee as custodian. They are in the names of Friedrich Bayer and Co., the Actien-Gesellschaft für Anilin Fabrikation, the Chemische Fabrik Griesheim Elektron, the Badische Anilin und Soda Fabrik, and Cassella's.

The CONTROLLER OF PATENTS (Mr. Temple Franks) elicited from Mr. J. Turner, the Managing-Director of British Dyes, Ltd., that they intend to make "Flavine" both as a dye and as an antiseptic. As Dr. Ligat, the Assistant Surgeon at the Middlesex Hospital, had lately described in detail, another dye beside Flavine—brilliant green—has been found extremely efficacious as an antiseptic.

The CONTROLLER pointed out that it would be necessary for the applicants to invent another name for "Flavine" when they sold it as a dyestuff. Five or six applicants had asked for permission to make it as an antiseptic; and the Board of Trade had decided that they must all manufacture it under the same name. The Court favoured "Acriflavine." British Dyes' application for licence to use these 32 patents was likely to be granted at a royalty of 2½ p.ct. (as before), and of 1 p.ct. for the manufacture of intermediate products.

Failure to Answer Telephone Call.

Mr. Arthur Bromley, the Manager of the Batley Corporation Gas-Works, was fined £5 and 5s. witness fees last week for failure to answer an air-raid telephone test call at 2.40 a.m. on April 26. It was stated in defence that the call had been heard and answered by the night watchman; but it turned out he was talking to nobody, as a night switch used for a direct connection either to the telephone exchange or to the Town Hall had not been properly set by the clerks before leaving the office.

MISCELLANEOUS NEWS.

GASHOLDERS AT ASHTON AND DUKINFIELD DESTROYED.

Over £35,000 Damage through Chemical Works Explosion.

As the result of a disaster at a chemical works situate in the West end district of Ashton-under-Lyne, the town itself, and the surrounding districts—Dukinfield, Stalybridge, Mossley, Denton, and Hyde—have been plunged into grief and mourning. The cause of the calamity is being inquired into by the Lancashire Coroner (Mr. G. S. Leresche), with the assistance of Major T. H. Crozier, Inspector of Explosives; Mr. W. H. Seal, H.M. Inspector of Factories for the Manchester area; and several representatives of the Ministry of Munitions.

Briefly, what happened was this: About 4 o'clock last Wednesday afternoon, a light was seen at the chemical works of the Hooley Hill Rubber and Chemical Company. Closer investigation proved that the "light" was a small fire; and the fire brigade were called. As they were proceeding to the spot, an explosion occurred at the chemical works, and completely wrecked two of the double-lift holders at the West-End storage station of the Ashton Gas Company, and also seriously damaged two holders at the Dukinfield Corporation Gas-Works, besides causing great havoc to the other parts of the works and the gas offices in Charles Street.

The storage station of the Ashton Gas Company is situate on the Lancashire side of the chemical works—within 100 ft. of the latter; and the holders at Dukinfield, on the Cheshire side of the chemical factory, are about 600 yards away; the gas offices being another 100 yards distant. When the "JOURNAL" representative visited the scene of the disaster, he found over a square mile of desolation, closely barricaded and guarded by the military authorities and police on both the Lancashire and Cheshire sides of the two gas-works and the chemical factory.

The detonation—the first explosion occurred at 4.24 p.m.—shook both Ashton and Dukinfield severely; and the effect was felt three miles away. Fires were caused in a number of cotton mills and other factories; many operatives being injured by the flying *débris* from the chemical works. So terrific was the explosion, that within an area of a mile on the Cheshire side of the factory there was scarcely a pane of glass left intact in mill, workshop, or dwelling-house; while on the Lancashire side—a thickly populated part of Ashton—for almost a similar distance, along the whole length of Stamford Street (the principal thoroughfare of the town), and along Stockport Road a large number of plate-glass windows were smashed to atoms. Over a hundred cottages which surrounded the chemical factory were demolished.

The damage to the Ashton storage station is estimated by the Gas Engineer (Mr. Joseph Townsley) at between £25,000 and £30,000; and that at Dukinfield at £10,000. In Mr. Townsley's opinion, one of the holders was set on fire through parts of the chemical works machinery forcing a way through the sides, and the flames from the chemical works ignited the gas. A huge piece of metal lies near the governor-house, thus lending colour to this theory, and indicating plainly that, but for the resistance offered by the two holders, appalling loss of life and damage to many important engineering works would have occurred. By acting as a "buttress," the holders took the full force of the explosion on the left-hand side of the factory, and thereby prevented a much more serious state of affairs occurring. One of the Ashton holders was half-inflated, and the other fully; two men being engaged at the time of the explosion in putting the finishing touches to the painting. There was no fatality at the Ashton works; and the supply of gas to this and other parts of the borough has not been interrupted. The main carbonizing station, in Catherine Street, is about a mile from the West End storage works, and was not affected by the explosion. Mr. Townsley will have the cordial sympathy of his professional brethren in his troublesome experiences, as will Mr. William Lindley, at Dukinfield; but while Mr. Townsley has had the felicity of being able to continue his gas supply uninterruptedly, Mr. Lindley's works have been so severely damaged that gas-making has, for a few days, ceased.

At both places the gas-plant contractors were early apprised of what had occurred, and made splendid response to the urgent calls for assistance. They were quickly on the scene. One firm's representative travelled over 200 miles, and was surveying the damaged works within twelve hours of the explosion. Gangs of men and material followed within 36 hours. On Saturday night, we were assured that gas-making would be resumed in Dukinfield within a week, notwithstanding the enormous amount of work that has to be accomplished ere this is achieved.

OFFERS OF HELP DECLINED WITH THANKS.

The Dukinfield Town Council met on the evening following the explosion, when Mr. Joseph Cooke, J.P. (the Chairman of the Gas Committee), and Mr. W. Underwood, J.P. (the Deputy Chairman), together with Mr. Lindley, reported upon the position of matters. The Town Clerk announced that offers had been received from Ashton, Stalybridge, Hyde, and Mossley, to supply gas. It was, he said, at first feared that the Dukinfield works would be out of action for many months; but a second examination showed that the damage to one of the holders was not so serious as at first anticipated. It was thought by the experts that it would take longer to connect the mains of Dukinfield with those of the adjoining authorities than it would do to repair the damage to the holders. All the offers from the surrounding gas undertakings were therefore declined with thanks.

At Ashton, the Directors of the Gas Company met again last night (Monday), when arrangements were made which will secure a complete supply of gas being available for next winter's use.

THE KILLED AND INJURED AT DUKINFIELD GAS-WORKS.

While it was fortunate that only two employees of the Ashton Gas Company were engaged in the storage station at the time of the explosion, and that they escaped with comparatively minor injuries, the Dukinfield gas workers did not fare so luckily; twelve or fourteen workmen being in the yard when the impact took place. The explosion was severely felt; and the life of George Greenhalgh, a labourer, was lost. The nearest large object in Dukinfield from the scene of the explosion is the gas-works. Apparently the iron work and *débris* from the chemical works were blown high into the air and scattered in all directions. Mr. George Lindley, the foreman of the works, said that immediately following the explosion a "hail of metal and brick" fell on the holders and other buildings in the gas-works yard. A group of workmen were near one holder when a piece of flying metal struck it, and the escaping gas caught fire. The other holder was also damaged and caught fire. The flames enveloped Greenhalgh and several other men, who were badly burnt about the body. Among those who were injured were Harry Lindley (a son of the Gas Engineer), who is employed in the Mainlaying Department, and George Lindley (the foreman), who was on top of one of the oxide sheds when the disaster occurred, and was hurled to the ground. Quickly recovering himself, however, he ran to the assistance of Greenhalgh.

THE DAMAGE AT DUKINFIELD.

The two holders at Dukinfield became affected ten minutes after the explosion took place at the chemical works. Both the holders were burst and put out of action—one of them being reduced to practically a scrap heap. The other was punctured on the side and on the top. The gas supply was, of course, immediately cut off, and the town will perforce remain in darkness at nights until such time as the supply can be safely restored. There are eight beds of Ω-shaped retorts (Drake's settings), 64 in all; but only four beds are generally used; and these seem unaffected; the principal damage being to the two holders. The roofs of the retort-house, coal-breaker house, smithy, and governor-house were severely damaged by the flying pieces of girders and machinery, as also were the walls of the governor-house and the gas-engine room. Nearly every window on the works was blown out; and in many cases doors were wrenched from their hinges. The oxide sheds were particularly badly damaged.

INTERVIEW WITH LORD BEAVERBROOK.

Mr. Joseph Cooke, J.P. (the Chairman of the Gas Committee), and his colleagues, have had an interview with Lord Beaverbrook—formerly Sir Max Aitken, M.P. for Ashton-under-Lyne—who is specially visiting the district as a representative of the Ministry of Munitions, and have impressed upon him the necessity of liberating as much labour and material as possible, so that the damage to the works may be repaired speedily. Unless this is done, many of the local factories will for a long time be without driving-power for their machinery. The necessary assurances have, we understand, been readily given by the Ministry.

INQUEST ON DUKINFIELD VICTIM.

An inquest was opened on Saturday afternoon on the body of the man Greenhalgh, by the Cheshire Deputy-Coroner (Mr. J. A. K. Ferns, of Stockport). At the outset he expressed sympathy with the relatives of all who had suffered by the explosion at the chemical works—latest reports show that 41 were killed and 130 injured. After formal evidence of identification, the inquest was adjourned. It was stated in the course of the inquiry that at the time of the explosion Greenhalgh was standing, with other men, near a holder, situate about 400 or 500 yards from the chemical works. The holder was struck by a heavy piece of hot metal, and the gas was set on fire. Greenhalgh was enveloped in a huge sheet of flame, and received terrible burns all over the body.

FROM A TECHNICAL CORRESPONDENT.

A technical correspondent writing says: Doubtless you will have had copies of the foolish reports relating to the explosion in the Manchester papers; and from these accounts it might be inferred that the trouble was caused through the gasholders exploding, rather than the reverse. A statement of fact is as follows.

The storage station for the Ashton works is about 175 yards from the scene of the explosion; and the two gasholders each contain about 850,000 c.ft. They are of identical construction, having sixteen heavy cast-iron columns, with two rows of girders—one having additional wind-ties. They are two-lift holders, upwards of 30 ft. deep, in brick tanks. The inner lift of one was almost full; while the adjoining holder had when the explosion occurred been filled to its utmost capacity, to allow of the painting being completed.

There appears to be evidence that the holders split by the force of the concussion, in addition to being injured by flying *débris*. Two columns in one case have been blown bodily into the tank, together with the girders and portions of the adjoining two. On the other holder, a single column disappeared, half of the next, and the three following. The latter were on the side of the holder away from the explosion, and have fallen around the tank, one splitting over the top of the foreman's house, where it now rests, together with one of the girders.

Both holders appear to have been blown bodily against the framing away from the explosion; but in each case the framing away from the explosion is intact. They are a crumpled-up heap, resting in the bottom of the tank, and fired during the descent; but the Engineer was promptly on the scene, and shut the valves directly the holders had come to rest.

Over the side of the railway and valley lie the Dukinfield works. Unfortunately, both their holders, which are considerably smaller than the others, have been destroyed in a similar way; and the supply of gas has been cut off.

In connection with the pooling arrangements entered into, as already notified, by the petroleum companies, the following firms have, at the request of the Government, signified their willingness to carry on the distribution of petroleum products through their respective organizations: Carless, Capel, and Leonard; the Gas Lighting Improvement Company, Ltd.; S. Bowley & Son; and Meade-King, Robinson, & Co., Ltd.

GAS-WORKS RESULTS AT WIGAN.

The Chairman of the Gas Committee (Mr. H. Farr) entered into a lengthy explanation of the operations of the Gas Department at the last monthly meeting of the Wigan County Borough Council.

Moving the confirmation of the Committee's minutes, Mr. Farr said the year ended March 31 had been a difficult one for all gas undertakings. In the early part of the year, it was easy to see that they would have these difficulties to contend with; and they were "light" difficulties. The first thing to realize was that they must do their best to make up with cooking and heating; and he thought they might claim that they had been fairly successful, in that they had fixed 1500 cookers and between 700 and 800 gas fires and ranges. These appliances had saved the situation. Although the Gas Committee had had the difficulties he had named, the revenue they had received was £3000 more than last year. In addition, they had done well out of coke. They would have done still better if they had not been harassed and worried through the shortage of labour. For eleven weeks they had to work the water-gas plant night and day without stopping, a thing which had never happened before. As far as their finances were concerned, what they were paying out of revenue ought to be appreciated. In former years it was customary to pay for the fitting of new meters and the laying of mains out of capital. This time, they had no capital expenditure on this account. The whole of the new meters and mains had been charged to revenue, and amounted to £1400 or £1500. The cookers, too, had been installed out of revenue, and cost over £2000 in fitting alone. The demand for cookers was so great that it was impossible to pay for the whole of them out of one year's revenue. They hoped in the near future to get some benefit from the money they had spent out of revenue. No doubt they would have to contend with a shortage of coal during the coming winter; and they were preparing for it. He was also glad to say that, owing to the large purchase of gas oil in March of last year, they had at any rate half enough to see them through the coming year. The Engineer (Mr. F. Betley) was entitled to credit for looking such a long way ahead. With regard to the consumption, when they remembered that they had 25,000 customers, and only 5000 had been wise enough to instal either a gas fire or cooker, there was plenty of scope for their cookery campaign; and if they installed as many again this year as they did last, they were going to keep up the output of gas.

The minutes were adopted.

BURTON-UPON-TRENT GAS-WORKS REPORT.

In submitting the annual report of the Gas and Electricity Committee at a meeting of the Burton-on-Trent Town Council, the Chairman (Alderman T. E. Lowe) said it was very satisfactory to find, after another year's trading, that they had made a net profit of £11,780, and that they had devoted £5000 in aid of the rates and £6780 to the reserve fund. The Committee were particularly glad that they had such a substantial sum to add to the reserve fund, which now amounted to over £10,000. This was not a very large working capital for a business with a turn-over of more than £70,000 a year. The profit had been made despite coal at a price the like of which they had never had to pay before—an average of 18s. 10d. per ton during the last year. The coal bill was up by £3300, despite the fact that 27,000,000 c.ft. less gas had been made than in the previous year. They had not maintained the same yield of gas per ton of coal carbonized; and this had somewhat increased the coal bill. Another factor they had to contend with was the increased amount of gas unaccounted for. It was difficult to trace the cause at once; but the management would use every endeavour to reduce it to the normal amount of about 5 p.ct. instead of 6½ p ct., as it had been in the past year. Residuals had been a very great help to them; and Mr. R. S. Ramsden (the Manager) was to be congratulated on having obtained an average of 21s. 4d. per ton for all the coke sold—which was a record. The amount secured for residuals was 82 p.ct. of the cost of coal, &c. Bearing in mind the adverse factors, he did not think they had had a discouraging year's trading. He had compared their accounts with those of many other concerns owned by gas companies, as well as municipalities, and Burton did not come out badly. In fact, in almost every case they came out with "flying colours." The comparison between last year's trading and ten years ago showed that the net profits for the two years were almost identical. They were charging 3d. per 1000 c.ft. more for gas ten years ago than they were to-day. The price of coal had almost doubled; but this was compensated for by the high returns from residuals. The capital expenditure had now reached £277,900; whereas ten years ago it was only £210,000. This meant that over £67,000 had been spent on improvements at the works during that period. The outstanding debt had, however, been reduced from over £53,000 to £35,749 in the ten years; and therefore more than £84,000 had been provided out of revenue to pay for capital expenditure. This was the real secret of the financial strength of the undertaking. They had had to pay heavier prices for coal, increased wages and war bonuses, higher taxation, and yet to-day, if necessary, they could reduce the price of gas to consumers. In many large towns increased prices were being charged for gas, owing to war costs; but they in Burton were in a position to reduce the price, if necessary. At present, the price of gas was lower in Burton than in Birmingham; and this had never occurred before.

The report was adopted.

The accounts show that the total revenue for the year was £77,653, and the working expenses £58,056. The profit-sharing bonus amounted to £324, and the war allowances to employees to £1027; the gross profit being £18,246. After meeting loan charges and other items, including £1278 for new meters, stoves, &c., the net profit for the year

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was £11,780, as compared with £14,825 a year ago. The net cost of gas per 1000 c.ft. sold during the year just ended was 17·91d., entitling the 118 employees of the department with not less than three months' service to a bonus of 3½ p.ct. The quantity of gas made as registered by the station meter was 389,493,000 c.ft., as compared with 416,972,000 c.ft. in the previous twelve months; the percentage unaccounted-for being 6·81, against 5·07, and the make per ton of coal carbonized 10,518 c.ft., against 11,075 c.ft. The average price received for gas (ordinary, prepayment meter, and public lighting supplies) was 2s. 7·27d. per 1000 c.ft. The respective charges per 1000 c.ft. are: For ordinary purposes, 2s. 4d. to 2s. 6d.; motive power, &c. 1s. 7d. to 2s. 1d.; prepayment meters, 3s. 2d.

BRIDGE OF ALLAN GAS-WORKS SINKING FUND.

At a recent meeting of the Bridge of Allan Town Council, the Gas Convener and Town Clerk reported as to interviews with the Secretary for Scotland and his officers, having as a result that the Secretary for Scotland could not agree to allow of contributions to the sinking fund being suspended for the duration of the war. He acquiesced, however, in the proposal that the gas charge should not be fixed at a price higher than that at which the Committee considered it would be directly profitable, and that only a moderate gas guarantee rate should be levied. The levying of a moderate gas guarantee rate, the Secretary for Scotland had explained, had become advisable, having regard particularly to the fact that the ratepayers were, under the existing lighting restrictions, being saved the cost of the lighting of public lamps, and that the gas undertaking was suffering correspondingly. The Convener stated that the Secretary for Scotland had indicated that, if the Gas Committee adopted his suggestions, he (the Secretary for Scotland) would consider they had done everything that was reasonable under present-day conditions, and would not insist upon a gas guarantee rate being levied to meet the full requirements of the Burghs Gas Supply Act. In this way, the Convener stated, the necessity for fixing an excessive price for gas, and at the same time imposing a heavy gas guarantee rate, would be obviated.

The Committee considered the estimates for next year, showing a deficit of £1500. The guarantee rate required would be 1s. 3d. in the pound; and the Convener proposed that the present price for gas should continue, and that a contingent rate of 3d. in the pound be imposed. This was agreed to.

The matter of the suspension of payment to sinking funds has been recently considered by a number of corporation gas undertakings in Scotland, in view of their serious financial position, due to decreased sale of gas and higher cost of material. The arrangement come to in the Bridge of Allan case does not appear to commend itself altogether as quite satisfactory; for, with an estimated deficit of £1500, and a contingent rate of 3d. yielding only £330, the deficit to be carried forward at the end of the year will be considerable. The Secretary for Scotland evidently agrees that the annual deficits should continue, without having recourse to a high price for gas, until better times come again, when the losses can be gradually wiped off. The Bridge of Allan Gas-Works were only acquired by the Town Council in 1914, when the price of gas was 3s. 8d. per 1000 c.ft. It is now 5s. 3d. For the past year, the consumption has gone down about 25 p.ct.

ARBROATH GAS ACCOUNTS.

Price of Gas Increased.

In his report, which has been submitted to the Arbroath Town Council, the Gas Manager (Mr. A. C. Young) stated that the gas manufactured in the past financial year amounted to 118,681,900 c.ft. —a decrease of 6,322,800 c.ft. on the previous year. The quantity sold to ordinary consumers, including gas-engine proprietors and for street lighting, was 61,695,055 c.ft., a decrease of 6,035,390 c.ft.; and to slot-meter consumers 50,931,800 c.ft., a decrease of 18,050 c.ft. The effect of the Summer Time Act, it was pointed out, had been to reduce the output of gas during the summer of 1916 to the extent of about 2,500,000 c.ft.; but notwithstanding the Summer Time Act and the fact that the gas used for public lamps had decreased by about 4,500,000 c.ft. since 1915-14, the gas sold this year exceeded that sold during the year ended May, 1913, by 1,500,000 c.ft. Since the Summer Time Act came into operation this year, the output had been 3 p.ct. greater than for the corresponding period of last year.

The total amount received for gas sold through ordinary meters, prepayment meters, and for gas-engines during the year was £16,181, a decrease of £1955. Of this decrease, £1173 was represented by the reduction of 2½d. per 1000 c.ft. in the price of gas a year ago. The approximate increase in expenditure that had occurred compared with 1914, to produce the same output of gas as was made during the past twelve months, was: Increased price of coal, £2964; carting, £684; wages and war bonus and allowances to employees in the army, £484; income-tax, £334; interest, £450; sinking fund and contingency account, £600; insurance, repairs, tools, &c., £400; sulphuric acid, £400; reduced price obtained for tar, £708—a total increase of £7024. The increased prices received for coke, sulphate of ammonia, and oxide of iron during the year amounted to £2024.

The Convener of the Committee (Mr. Andrew Beatt) remarked that last year they were able to reduce the price by 2½d. per 1000 c.ft., which very few gas-works were in a position to do; and this year's advance had been made to meet the increased expenditure. He commented on the large amount which had to be paid for carting; pointing out that for every 1000 c.ft. of gas 2½d. went for carting. If those responsible for the building of the gas-works had placed the works alongside a railway siding, they would, he said, have saved this. The vertical retorts installed two years ago had been a complete success; the economies effected being equal to 6d. per 1000 c.ft. of gas.

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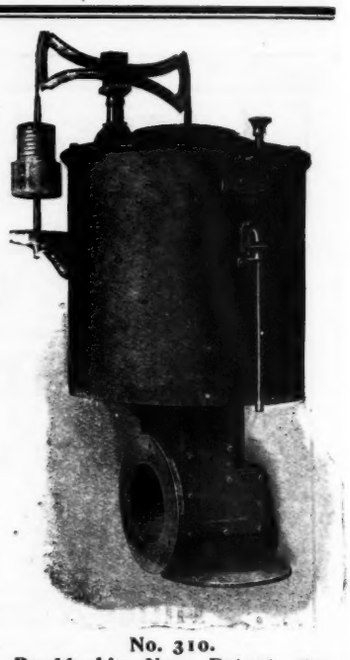

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SULPHATE OF AMMONIA PRICES.

Arrangements for Season, 1917-18.

An arrangement has been made, with the concurrence of the Departments of Agriculture for Scotland and Ireland, and after consultation with the Sulphate of Ammonia Distribution Committee, whereby the price of sulphate of ammonia during the season 1917-18, 24½ p.ct. basis, in makers' single bags, net cash delivered to consumer's station in any part of the United Kingdom, in quantities of not less than 2 tons, is not to exceed the following :

For orders placed with makers for delivery during :

(*a*) June 1, 1917, to Sept. 30, 1917, £15 7s. 6d. per ton.

For this first period, orders for 60 tons and upwards are to be placed by June 20 for delivery in Great Britain, and by July 10 for delivery in Ireland. Delivery in Great Britain must be in four equal monthly quantities, and in Ireland in three equal monthly quantities. Smaller quantities must be ordered before Sept. 15.

(*b*) Oct. 1, 1917, to Dec. 31, 1917, £15 15s. per ton.

For this second period, orders for 60 tons and upwards must be placed by Sept. 10 for delivery in three equal monthly quantities either for Great Britain or Ireland. Smaller quantities must be ordered by the 10th of each month, for delivery during that month.

(*c*) Jan. 1, 1918, to May 31, 1918, £16 7s. 6d. per ton.

For this third period all orders, large and small, must be given by the 10th of each month, for delivery during that month.

The foregoing prices are subject to a discount for cash of 10s. per ton to manure mixers, agricultural merchants and dealers, and co-operative societies. In the event of lack of adequate commercial storage in any district making it necessary for the Food Production Department to authorize Agricultural Executive Committees to provide the necessary facilities, such Committees shall be supplied at the merchants' rates.

Quantities of less than 2 tons will be supplied at the above rates, provided they form part of a bulked order of not less than 2 tons, so as to facilitate railway transport and avoid wasteful use of trucks.

It is calculated that, having regard to the quantities which it may be expected will be sold during these periods, the average price realized throughout the year will be about £16 per ton in the case of deliveries to farmers and other consumers, or £15 10s. in the case of dealers.

Where the purchaser takes delivery at the maker's works for conveyance otherwise than by rail, the price will be 10s. per ton less. For sulphate of ammonia of a higher or lower quality, a difference of 3s. 3d. per ton is to be allowed in respect of each ¼ p.ct. above or below 24½ p.ct. Fractional differences of less than ¼ p.ct. will not be taken into account. Where makers require purchasers to provide their own bags, the actual cost of bags at the time of delivery shall be allowed.

With a view to encouraging the distribution of sulphate of ammonia and to equalizing the delivery charges, it is proposed to continue to pay from the sulphate of ammonia fund grants-in-aid in all cases where the delivery charges exceed 10s. per ton. The conditions of the grant explained in the Department's circular-letter of April 17 will be applicable to all deliveries made at prices not exceeding those mentioned above during the season 1917-18.

Sales to the Channel Islands will be at the prices prescribed for home consumption, and will include delivery free on rail port of shipment. No claim on the sulphate of ammonia fund will be entertained in respect of delivery beyond the railway station at the port of shipment.

The net cash retail price of sulphate of ammonia to consumers, in quantities under 2 tons, for delivery in Great Britain by dealers *ex* store or by makers *ex* works, is not to exceed the following :

	Quantities of 28 Lbs. and less than 1 Cwt.	1 Cwt. and less than 2 Cwt.	2 Cwt. and less than 1 Ton.	1 Ton and less than 2 Tons.
	Per Cwt.	Per Cwt.	Per Cwt.	Per Ton
June 1 to Dec. 31, 1917	20s.	18s.	17s.	£16 10s.
Jan. 1 to May 31, 1918	21s.	19s.	18s.	£17 5s.

No additional charge to be made for excess over 24½ p.ct. basis in respect of these small quantities.

The Department of Agriculture and Technical Instruction for Ireland will issue a notice later, as to retail prices in Ireland.

In the event of the Ministry of Munitions sanctioning an increase in the price of sulphuric acid over and above the prices fixed on Jan. 1, 1917, the Food Production Department will be prepared to consider the granting of a corresponding concession in respect of sulphate of ammonia sold for home agricultural use.

The food production policy of the Government makes it necessary to reserve for application to next year's crops very much larger quantities of sulphate of ammonia than have hitherto been required for use in the United Kingdom. During the past twelve months about 140,000 tons have been used for agricultural purposes. As a very much larger area of land is now to be brought under the plough, the quantity required during the coming season cannot be estimated at less than 200,000 tons; and it is hoped it may reach 240,000 tons.

It is anticipated that the sliding-scale of prices given in clause 1 will induce dealers, merchants, and others to take delivery in summer and autumn, and thus prevent any congestion at works.

The considerable additional consumption for munition purposes will make it necessary to maintain the prohibition of export without relaxation except so far as it may be desirable to allow some small quantities to our Colonies or in special cases to Allied Countries. The Director-General of the Food Production Department is convinced that makers will recognize how important it is in the national interest that they should use every endeavour to dispose of their stocks for agricultural purposes; but he thinks it well to point out that consent will not be given to any sulphate of ammonia being exported until he is satisfied that all demands in this country have been met. In the occasional instances in which export is allowed, the Food Production Department will prescribe the works from which sulphate may be purchased.

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RENDERING BODIES TRANSPARENT BY COAL-TAR PRODUCTS.

In the "JOURNAL" for May 22, p. 346, appeared a report of an application in the Patents Court by the Trustees of the British Museum (South Kensington, Natural History Section) for a licence to use a German patent for rendering organic bodies transparent and translucent to light by the use of coal-tar products.

A representative of the "JOURNAL" has just been shown by Dr. S. F. Harmer, F.R.S., at the Museum, half-a-dozen bodies which have been so treated; and the success of the process is undoubted. Incidentally, Dr. Harmer indicated the range of coal-tar products useful for bringing organisms of different types to the necessary degree of transparency for exhibition or research purposes. The principle is that the body, after treatment, is placed in a liquid having the same index of refraction as the tissues of its own body (or the mean of the ascertained indices of the various tissues). Dr. Harmer says an example of such a liquid, the index of refraction of which corresponds to most of the animal tissues, is a mixture of three parts of salicylic methyl ester and one part of benzyl-benzoate. It is part of the history of the chemistry of aromatic compounds that Cahours in 1844 discovered that oil of wintergreen is substantially methyl salicylate, and that this discovery led to its artificial production from synthetically prepared salicylic acid. Dr. Harmer has a work, published by Dr. Spalteholz, in Leipzig, in 1914, which gives a list of liquids yielding indices of refraction likely to be of use in relation to different animal bodies; and a relevant group of these is: Oil of wintergreen, 1·538; safrol, 1·542; benzyl-benzoate, 1·570; isosafrol, 1·577.

Supposing the animal body one wished to make transparent is a rat's, having an index of refraction of 1·560, the appropriate liquid into which to plunge it would be a mixture of safrol and benzyl-benzoate; the proportions duly ascertained by nice experiment.

Dr. Harmer produced the transparent rat of which much was heard in the Patents Court, and placed it in a case upon the table. The rat had been skinned before treatment; but, apart from this, it was in its natural state, except that the water in the tissues and all dark colouring pigment, as far as possible, had been chemically removed from the body by alcohol and benzol.

The rat, retaining its normal shape, had the aspect and consistency of yellow jelly, through which all the bones could be seen with the individual muscles, the arteries, and the internal organs. The liver is the most striking feature, by reason of its suffusion with dark pigment. In other cases were seen a transparent mouse, a frog, and a fish. The fabric of an intestine, in a separate case, was so translucent as hardly to be visible at all, and its shape was mainly inferred from the delicate network of arteries, which had been charged with injected red material for exhibition purposes.

Dr. Harmer's largest subject is a hand and arm, with the shoulder blade. Every bone is perfectly clear to the view, not as a shadow but "in the round;" and muscles, arteries, and other tissue can be severally traced.

COCKEYS OF FROME.

[COMMUNICATED.]

It will no doubt interest readers to learn that the old-established firm of Messrs. Cockey and Sons, Ltd., of Frome, manufacturers of gas-works and bye-product apparatus and constructional engineers, have, during the past four years, made considerable extensions and alterations to their works and plant.

The origin of the firm dates back over a century. It was started by the three brothers Cockey, who may be remembered by many older readers, not only as first-class engineers, but as genial business men. Before the advent of gas for commercial purposes, they attained a success in other branches of engineering; but on taking up gas-plant work, they gradually relinquished most of the other business, in order to give their main attention to the new department. A portion of the present works site was acquired for gasholder shops; but they continued to make all cast-iron work at the foundry in Bath Street. After a time, however, a new foundry was built adjoining the gasholder shops—obviously a more convenient arrangement, as it enabled them to meet the growing competition and keep well abreast of the times.

Messrs. Cockey have been responsible for the design, manufacture, and erection of a large number of gas-works in all parts of the globe, but particularly in South Wales and the West of England. It is interesting to note that at one time they held the record for the construction of the largest gasholder in the world. This holder would, of course, be a mere "infant" to-day; but the remark serves to show the desire of the firm to be always moving in the direction of progress.

Cockey's centre-valve for purifiers and their non-mechanical washer are well known; and their centre valve still retains a large measureof popularity. During the last two years, further patents have been taken out by the firm in connection with the valve; the most important feature of these being to make it reversible—*i.e.*, capable of working either up or down, as well as backwards and forwards. As to the Cockey washer, the firm state that they have one now under construction to deal with 5 million c.ft. of gas per diem.

New drawing offices have been built at Frome; and every care has been taken to ensure the comfort of the staff, and to promote efficiency in their work. Messrs. Cockeys are now a Government controlled establishment; but about nine months prior to the outbreak of war, the concern was taken over by an entirely new directorate, all the members of which are keen business men, and closely connected with the gas, iron, and steel industries. The Managing-Director (Mr. James Lawson) is well known to most readers; and under his administration

the works have, in spite of considerable difficulties, been modernized and extended. They now cover 4½ acres; but it is intended to further extend them, and build additional constructional shops.

The whole of the plant is electrically driven—the large machines by independent motors, the smaller ones in groups by shafting. The machine shop is spacious and well-lighted, and many new machines have recently been installed and others rearranged. The iron foundry is modern in every respect. New pattern shops have been constructed, which are provided with those labour-saving devices so necessary to-day in a first-class works. The constructional steel shops have recently been extended; and further shops are to be built as soon as the requisite labour can be procured. The firm make a large amount of plant to meet the requirements of steel works—notably, gas producers.

At this juncture, it is not permissible to give a more detailed description of the operations and plant of Messrs. Cockey and Sons, together with photographs of the various shops. This must be reserved till after the war.

HOUSE-TO-HOUSE CANVASSING.

Anything in the direction of a complete canvass of the district covered by the mains of a gas undertaking may be regarded as a large order in these times. Indeed, under ordinary circumstances, very few concerns in the United Kingdom have gone so far as to make an exhaustive inquiry, including users and non-users of gas, and covering not only domestic but industrial purposes, followed up by continual endeavours to obtain new business wherever a possible opening presents. Yet this is the course that has been adopted by Mr. L. Gaston, Manager of the new business department of the Knoxville (Tenn.) Gas Company, as described in a paper presented at the recent Southern (U.S.A.) Gas Association Convention.

He recommends a display of appliances suited to the size and particular circumstances of the district concerned, and the employment of salesmen competent to bring prospective customers to the showroom, and demonstrate the advantage of gas as compared with other fuels. Small undertakings, who think that they cannot afford to run such a department, should rather inquire if they can afford to do without it. A study of a particular problem, and intensified effort on one line of appliance at a time, would result in the placing of the greatest number of installations in the shortest length of time.

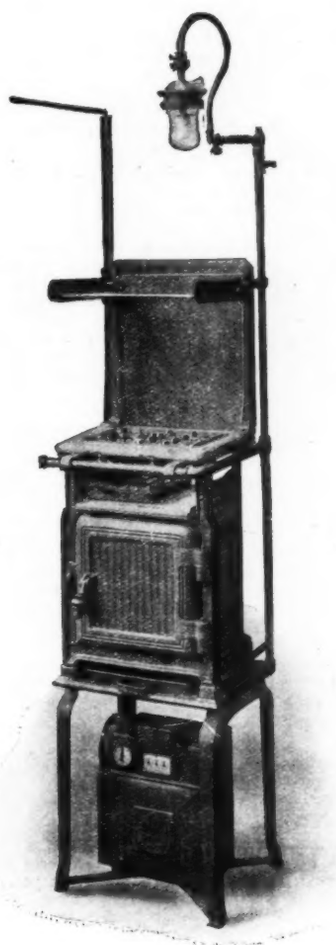
About a year ago, he started a campaign, with the object of converting to gas industrial operations at present dependent on solid or liquid fuel. Complete working data were secured as to type of appliances, cost of fuel, labour, and production in the district, and the results carefully compiled and thoroughly discussed. While small gas-forges suitable for light work are on the market, there is nothing that would compete with other fuels on heavy work; and he is carrying out, with promising results, a series of experiments in this direction. At a large copper and brass works, all the heating and annealing is done by gas, with the exception of melting metals, for which they at present use fuel oil; but he has a proposition on hand for effecting this work with gas. In restaurants and hotels, the use of gas is found to be confined to comparatively small appliances; but he has successively introduced the "all-round" gas kitchen. Much perseverance is needed to overcome scepticism and prejudice, not only on the part of the proprietor, but of cooks not used to gas.

Much of the dissatisfaction and want of success with gas is due to make-shift appliances; a gas-burner being simply inserted in an appliance designed and fitted to use other fuel. One would not think of fixing a gas-burner in the grate of an ordinary coal cooking range. There must be full and complete co-operation of gas employees and the makers of apparatus, with a view of securing the best designs, capable of giving the highest possible efficiency; and, further, the actual user must be properly trained in the use of the appliance, with the same end in view. There should be an inspection department, which should see that the cause of gas was not suffering by reason of improper usage, or appliances in bad repair. Much could be done by giving the best possible service, and by recognizing defects peculiar to the construction or usage of existing apparatus.

French Gas Supply Regulations.—A Reuter message from Paris states that the Government have issued a decree prohibiting the use of gas from 8.30 a.m. to 12.30 p.m., from 2 to 5.30 in the afternoon, and from 9 at night until 4.30 in the morning. The Minister of Armaments is empowered to grant exemptions from this rule. The maintenance of hot-water services will only be permitted on Saturdays and Sundays in hotels and private houses. Electrical engineers are instructed to endeavour to find means of substituting electrical energy for steam-engines in factories.

Satisfaction at Glastonbury.—Addressing the Glastonbury Town Council, Alderman Morland said the gas undertaking had been carried on under difficulties of a character little realized by the general public. Owing to the abnormal position as regards labour, material, reduction of lighting, generally increased expenses, &c., there had been a loss on the year of £400, which, however, still left some £200 available out of the £619 they fortunately had in hand out of past profits. It might be necessary to make an additional charge for gas, to avoid an extra rate having to be imposed, if present conditions continued. On the other hand, Mr. D. E. Garlick (the Secretary and Manager) strongly urged them not to do this at present, as there were signs of improvement in several directions, and he hoped to be able to get level this year. Mr. Garlick was carrying on splendidly under exceptional difficulties; and, if these were properly appreciated, he would be applauded, and not criticized. The Mayor said he had had experience of the difficulties of carrying on a business enterprise in war time, and thought, under these difficulties, the gas undertaking had done wonderfully well. The quantity of gas sold was 29,150,600 c.ft., as compared with 29,932,500 c.ft. in the preceding year; the proportion unaccounted for having been reduced from 7·5 to 6·4 p.c. The balance on revenue account is £2825, against £3151.

Slot Installations



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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *June* 18.

Pitch is quiet, as is to be expected; the shipping season having been brought to a close by the present hot weather, although it is reported that one or two small cargoes are still being loaded. The price of 37s. 6d. to 38s. per ton net *ex* maker's works is unchanged. Tar is in good demand for various purposes. There is a fair amount of inquiry for solvent naphtha; and the price is rather firmer at 2s. 2d. to 2s. 3d. per gallon, net and naked at sellers' works. Creosote is unaltered at the figure last mentioned—*i.e.*, 4¼d. to 4½d. in bulk at makers' works.

In sulphate of ammonia, business for agricultural purposes for this season is now practically over. For next season, a new schedule of prices has recently been issued by the Board of Agriculture.*

Tar Products in the Provinces.

June 18.

Markets for tar products remain about the same.

The average values for gas-works products during the week were Gas-works coal tar, 20s. 6d. to 24s. 6d. Pitch, East Coast, 16s. 6d. to 17s. 6d. per ton; West Coast—Manchester 15s. 6d. to 16s. 6d., Liverpool 16s. 6d. to 17s., Clyde 17s. to 18s. Benzol, 90 p.ct., North, 10¼d. to 11¼d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6¼d. to 6½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3¼d. to 3½d. Heavy oils, in bulk, North, 3¾d. to 4¼d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

Sulphate of Ammonia in the Provinces.

Liverpool, *June* 16.

Licences are still unobtainable, and so far as export business is concerned there is no alteration. For home agricultural purposes new prices have recently been fixed, and the figures for sales direct to farmers are now £15 7s. 6d. per ton for June-September delivery, £15 15s. for October-December, and £16 7s. 6d. for January-May, net cash in makers' bags, carriage paid to stations in Great Britain and Ireland, with an allowance of 10s. per ton in each case to mixers and distributors.

Nitrate of Soda.

The market for this article is again easier on spot, and to-day's values are 25s. per cwt. for ordinary quality, and 25s. 6d. for refined.

* See p. 589.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade seems a little easier; but on the whole the inquiry is good, though a lack of ready steamers interferes with coal export. In the steam coal trade the price is steady at 30s. per ton f.o.b.; second-class steams are quiet at from about 21s. to 22s. 6d.; while steam smalls sell at 16s. to 19s. 6d., according to class. In the gas coal trade, the requirements in some cases are for additions to the stocks, which are often small; but there are fair exports in the circumstances at the shipping ports. Best Durham descriptions are from 24s. 6d. to 26s. per ton, f.o.b.; second-class qualities are 17s. to 18s. 6d.; and for "Wear specials," the quotation is generally from 28s. 6d. to 29s,, with a good demand for the latter class. Deliveries on contract are fair, and this despite the heavy freights that have to be paid—18s. to 20s. for gas coal, Tyne to London, and very much higher freights relatively for voyages to distant ports, for which at present only neutral steamers seem available. It will show the tendency of the export coal trade if it be said that for the past month the quantity of coals "sent foreign" decreased about 4 p.ct.; while the value of the coal for the same time increased by nearly 3 p.ct. Good gas coke is from 31s. to 32s. 6d. per ton f.o.b., according to class and place of shipment. Freights on coke are about 45s. to Dunkirk and other Northern France ports.

West Bromwich War Bonus.—The West Bromwich Town Council have, on the recommendation of the Gas Committee, decided to grant another war bonus to the employees at the gas-works of 6s. per week. This makes a total extra war wage of 12s. a week.

Sheffield Gas Company's Bill.—Alderman R. Styring (the Chairman of the Sheffield Corporation Parliamentary Committee), in reply to questions, has stated that the terms of the compromise with the Sheffield Gas Company to avoid the Council's opposition to the Company's Bill were that the Company offered to reduce their application for capital powers from £1,285,000 to £924,000, and to abandon their proposal to establish a so-called sinking fund. The Corporation offered alternative terms, which were refused; and the Company declined further to proceed with the negotiations with respect to interference with the streets. The Company were successful in regard to the amount of capital they applied for, but were put under an obligation that, if within three years they failed to obtain statutory authority to erect gas-works on land not now belonging to them, their new capital should be reduced to £285,000, which sum includes £105,000 unexercised borrowing powers. The application to supply power gas was withdrawn. In consequence of the decision of the House of Commons Committee, it was decided not to appear on clauses; and the protection desired in respect of streets was not obtained. The amount of expenses already incurred by the Corporation in opposing the Bill was about £500.

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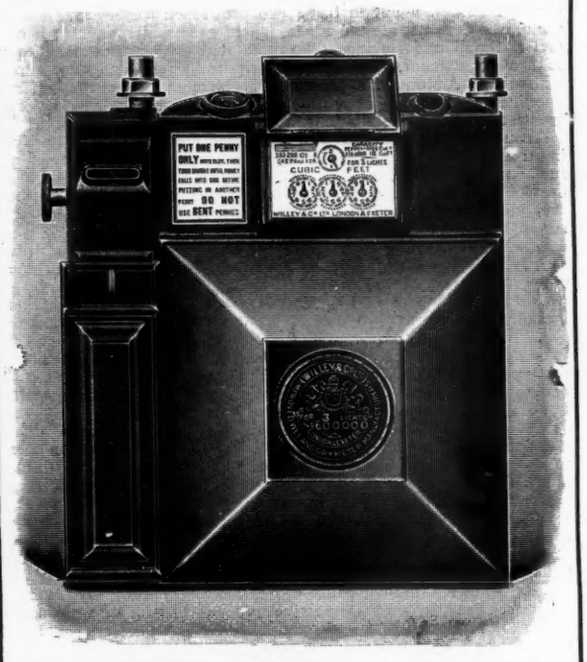

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Protected Trades and Tribunal Exemptions.

At the Southwark Tribunal, the point was raised as to the position of men who previously had exemptions from Tribunals, but now are in possession of certificates of exemption under the protected trades' schedules, as to whether they should surrender their Tribunal exemption certificates. It was held that, if they were withdrawn, neither the men nor their employers had a right to any further appeal at the Tribunals. Mr. Weaver said the certificates granted to the men under the schedule could be cancelled at any moment by the Recruiting Officer; and unless the men were now protected by the Tribunal, they and their employers would be deprived of the right to appeal. When a man was badged by the Ministry of Munitions, and the badge was taken away, he had the right to lodge an appeal at the Tribunal; and the same privilege should be extended to men receiving these new certificates. The Military Representative said the latest instructions from the War Office were that, in cases like this, when the men had received certificates under the schedule of protected trades, he was not to press for the withdrawal of the Tribunal exemption certificates; and in future he should not ask for their withdrawal. This would deprive no one of his right to an appeal to the Tribunal at any time, should the new certificates be withdrawn. The Tribunal agreed to permit the men to retain their exemption certificates granted by the Tribunal.

Conditions and Wages at Bradford.—A meeting of representatives of the Bradford Corporation departmental employees to consider the question of present conditions and wages decided to form a permanent joint representative committee of all societies having members in Corporation employ. It was resolved that a demand be made for a 65 p.ct. advance of wages on pre-war rates for all employees, irrespective of sex; and that, if no satisfactory agreement be reached, 21 days' notice be given to the Chief Industrial Commissioner's Department of the Board of Trade that a dispute is pending.

Gas Profits at Burnley.—After charging to revenue £3612 for the cost of the tar distillation plant, the profits of the Burnley Corporation Gas Department are £300 better than shown by the revised estimates presented in March on the fixing of the new rate. This was the brief announcement made by the Chairman of the Finance Committee at the Council meeting. The Gas Committee have instructed the Engineer (Mr. J. P. Leather) to tabulate the figures showing the annual working of the gas departments of thirteen corporations, so that the Sub-Committee may have them for the proposed inquiry into the operations at Burnley.

New Gas Rates at Leeds.—The advanced prices of gas at Leeds, from the June meter reading, for lighting, heating, and cooking are within the city: By ordinary meter, below 500,000 c.ft., from 2s. 8d. to 2s. 9½d. per 1000 c.ft.; 500,000 and under 750,000 c.ft., from 2s. 7d. to 2s. 8½d.; 750,000 and under 1,000,000 c.ft., 2s. 6d. to 2s. 7½d.; 1,000,000 and under 2,000,000 c.ft., 2s. 5d. to 2s. 6½d.; 2,000,000 c.ft. and upwards, from 2s. 4d. to 2s. 5½d. By prepayment meter: 2s. 11d. to 3s.; prepayment meter with cooker, from 3s. 2d. to 3s. 3d. The charges for supply outside the city are: To Stourton, 3s. 6½d. (advanced from 3s. 5d.) by ordinary meter; from 3s. 9d. to 3s. 10d. by prepayment meter; and from 4s. to 4s. 1d. by prepayment meter with cooker. The supply to Adel is charged at 3s. 7½d., instead of 3s. 6d., by ordinary meter.

Wages at Halifax.—At a recent meeting, the Halifax Town Council confirmed a recommendation of a Special Wages Committee that, with the exception of the clerical staff and tramway workers, the rates of wages for male employees under 21 years of age in the various departments be increased, as from April 1, to amounts bringing them, with war bonus, to 4s. above the pre-war rates; that the standard rate for overtime work for male employees be time-and-a-quarter for the first two hours, time-and-a-half for each succeeding hour, and double time for Sundays, if not included in shift work; that shift work where Sunday work is included be not considered as overtime, and that the present rates for Sunday shift work be continued; and that each Committee report to the Special Wages Committee on the question of increasing female employees' wages.

Midland Gas-Workers' Organization.—There has been much jubilation in the East Midlands regarding the success attending the operations of the Gas-Workers' and General Labourers' Union, now renamed the National Union of General Workers—an alteration of title significant of a widely spread net of membership in connection with the organization which owed its inception to Mr. Will Thorne, M.P. The founder of the movement, who is General Secretary, was present with Mr. J. R. Clynes, M.P. (the President), at a gathering last week in Nottingham, convened to do special honour to Mr. Arthur Hayday (the District Secretary), who was the recipient of an address and purse of money. It was mentioned that during Mr. Hayday's tenure of office as District Secretary, the membership within this part of the Midland area has increased from 2500 to 7600.

Last Year's Loss at Devonport.—At the meeting of the Plymouth Town Council yesterday week, the Gas Committee presented the accounts of the Devonport gas undertaking for the year ended March 31. These showed a gross surplus of £17,489; but after payment of £8746 for dividends and interest, contributing £9260 to the fund for the redemption of stock and loans, and paying £2545 in income-tax, there was a net loss of £3062, which brought the deficiency to a total of £4230. The detailed account showed that the expenditure on the manufacture of gas was £74,872, and on distribution £3029. War bonus to employees cost £472, and allowances to employees on active service £309. The income from the sale of gas was £71,199; rental of meters, stoves, &c., £11,271; and residuals, £19,005. The Committee recommended that, from the meter reading of the quarter ending June 30, the price of gas to ordinary consumers be increased from 2s. 11d. to 3s. 2d. per 1000 c.ft. Mr. Moses said the loss and the consequent increase of price resulted from the higher cost of coal and oil, together with the war bonus to the employees and the allowances to the men who were serving. They were things which could not be avoided in the present war conditions. The recommendation of the Committee was approved.

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The Calorific Standard Act.—It has been suggested to the Board of Trade that the whole of the matters dealt with by this Act should be made the subject of a departmental inquiry, and efforts are being started by certain interested parties to secure this.

Unsafe Flexible Gas-Tubing.—The Council of Newark(N.J.) have adopted an ordinance to prevent the use or sale of dangerous gas-tubing in the district, and to ensure safety in the consuming of gas. The need for this is seen by a fatality caused by the use of paper tubing, which led to the discovery of the fact that much unsafe tubing was being disposed of. All dealers are required to submit to the gas inspector samples of tubing proposed to be offered for sale, and to display approved samples on cards to be provided for the purpose. Considering the user's standpoint, at first some degree of freedom will be applied in examination and approval of tubing; but from time to time the standard will be raised, until the safest possible make has been attained. Periodical inspection of dealers' stores is to be carried out; and the public are to be reached by leaflets and lantern lectures along educational and preventive lines, through which safety suggestions may be offered. The penalty for the use, offering for sale, installation, or affixing to any gas appliance tubular hose or connection not first approved by the Municipal Inspector of Gas and Water Meters, is $20 for each offence.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for June 13.]

Nos. 7960—8284.

BAGLEY, D., "Regenerative coke-ovens." No. 8180.
FLEUSS, H. A., "Compressing or exhausting." No. 8060.
GAS-METER COMPANY, "Dry gas-meters." No. 8154.
MARTIN, A. F., "Producing oils from sharp, middle, creosote, &c., oils." No. 8139.
SCHROEDER, F. W., "Incandescent gas-burner." No. 8162.
SOUTHON, J. C. See Gas-Meter Company. No. 8154.
TULLY, C. B., "Separation of volatile products from solid carbonaceous materials. No. 8210.

Inverkeithing Gas-Works Purchase.—The negotiations for the purchase by the Town Council have been abandoned by mutual agreement; the Council having decided not to serve any further notice to purchase for a period of ten years from April, 1916. Each party has agreed to meet its own expenses; and the Company are now free to proceed with the additions to plant rendered necessary by the increased population, due to the near vicinity of Rosyth.

STOCK MARKET REPORT.

THE chief characteristic of markets in general within the Stock Exchange last week was a lack of animation and a reduction of energy and enterprise. There was a marked disposition to "wait and see," and this was probably to a large extent the offspring of the slow progress of Russian affairs towards a *dénoument*—at least, so far as is discernible by the public eye. Other factors were all of a nature good enough to engender cheerfulness. On the Western theatre, the further inroads made by Sir D. Haig's victorious armies at many points upon the German lines of defence were highly gratifying; while, on the Eastern front, the long-delayed extinguishment of King Tino was most gratefully hailed.

Not every department, however, was really weak. Home Government issues were firm, War Loans (and especially the 4½ p.ct.) being in request. There was some fluctuation in Americans and Canadians; but, on the whole, they showed out rather better. Argentines well maintained the position attained the week before. Into the Foreign Market, Greek loans were new comers—dull at first, but recovering later. Russian issues found few friends and French were easier, but Spanish, Brazilian, and Chinese were firm. In South Africans the tendency was rather in the downward direction. The Miscellaneous Market enjoyed most animation, especially Munitions and other Industrials. Rubber fluctuated but oil was in favour.

Business in the Gas Market was much about the same as the preceding week in point of aggregate—*i.e.*, not as abundant as dealers could desire. But it was equitably distributed among a larger number of undertakings throughout the list, instead of being almost monopolized by two or three big issues. There was not much change in prices. Quotations moved but slightly, and in both directions. Newcastle, Sheffield, and Cape Town were a little higher, and Gas Light ordinary and Primitiva a little lower. Other changes were only *ex div.* variations.

Bargains done for cash during the week were as follows: On Monday, European 11½, Gas Light ordinary 72, 72¼, 72⅜, ditto debenture 57½, Imperial Continental 80, 80½, Oriental 105½, Primitiva 40s., 40s. 7½d., ditto preference 60s., South Metropolitan 78, 78½. On Tuesday, Cape Town preference 7¼, European 11½, 11⅝, 11¾, Gas Light ordinary 71½, 72, ditto maximum 57⅛, ditto preference 73, Hastings and St. Leonards 50½, 51, Imperial Continental 79½, North Middlesex 10$\frac{11}{16}$, 10⅝, South Metropolitan 77½, 77⅝, 78½. On Wednesday, Bournemouth "B" 10⅝, ditto debenture 71½, Gas Light ordinary 72, ditto maximum 57⅞, Imperial Continental 80¼, Newcastle 69½, 69⅝, Primitiva debenture (1911) 57¼, 57½, South Suburban 76. On Thursday, Gas Light ordinary 71½, 71⅝, 72, ditto debenture 56¼, Monte Video 8½, Newcastle 70, 70½, South Metropolitan 78, South Suburban 76¾, 77, 77¼, 79½. On Friday, Bombay 5, Cape Town preference 7⅜, Gas Light debenture 55¾ *ex div.*, Monte Video 8¼, Newcastle 69¾, 70, South Metropolitan 77½, 78, 78¼, South Suburban 76¾, ditto debenture 88½, Tottenham "B" 69½, 70.

In the Money Market rates were quite easy for a while, but soon responded to an increased demand. The German mark is now worth 6⅞d. in Amsterdam.

The Bank rate is 5 p.ct., as fixed on April 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex. Dividend.	Previous Div. on Ordinary and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	58—63	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	50—55	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅞—6⅛	4⅞—5⅛	5
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water: 10 p.c.	23—30	24—26	..
388,110	10	,,	7	7/-	Bournemouth Gas and Water: B 7 p.c.	15—15½	10⅞—11½	10⅞
115,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	9½—9⅝	..
159,740	—	—	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	..	71—73	71½
992,045	Stk.	Feb. 26	14	55/-	Brentford A Consolid.	261—266	81—84	..
734,920	,,	,,	11	53/9	Do. B New	204—209	79—82	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	83—88	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	65—67*	..
217,380	,,	Feb. 26	11	10%	Brighton & Hove Orig.	208—213	150—155	..
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—159	102—107	..
530 000	20	Mar. 26	12½	22/6	British	44—45	33—34	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	66—68	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—58	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	2½—2⅝	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	6—7	7⅛—7½
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	62—67	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79½—80½	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	72—74	..
560 000	,,	,,	5½	46/8	Do. 3½ p.c. do.	103—105	66—68	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53*	..
800,003	,,	,,	4	—	Continental Union Ltd.	76—79	39—41	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	60—63	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c.	..	170—180	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅓%	Derby Con. Stk.	123—125	95—100	..
55.000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd.	17⅛—18	11½—12½	11½—11⅞
16.313 430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke: 4 p.c. Ord.	98—102	71—73	71½—72⅜
2,600.000	,,	,,	3½	3½%	Gas Light and Coke: 3½ p.c. max.	76—79	56—58	57⅛—57½
4,062,235	,,	,,	4	4%	Gas Light and Coke: 4 p.c. Con. Pref.	96—99	72—74	73
4,674 850	,,	June 11	3	3%	Gas Light and Coke: 3 p.c. Con. Deb.	72½—74½	55—57*	55¼—57½
130,030	,,	,,	10	10%	Gas Light and Coke: 10 p.c. Bonds	..	..	..
2'8,740	,,	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	50—55	50½—51
70 003	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅝	7⅛—8⅛	..
86,600	—	—	—	9½%	Hornsey 7 p.c.	..	120—130	..
131,000	Stk.	Mar. 12	7⅞	7⅞%	Ilford A and C.	151—154	102—107	..
65,78)	,,	,,	6⅜	5⅞%	Do. B	115—118	80—85	..
65,60)	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	68—71	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	79—84	79½—80½
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	62—65	..
235,342	,,	Mar. 12	6½	6⅜%	Lea Bridge Ord. 5 p.c.	119—121	85—90	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A	211—213	81—88	..
					Liverpool 5 p.c. Ord. B	146—148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	72—74	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅜	3⅝—4⅛	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	88—98	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11⅛—12	8—8½	8¼
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98½—99½	70—71	69½—70½
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	73—75	..
55,940	10	Feb. 26	7/14/0	7/-	North Middlesex 7 p.c.	14—15	10—11	10½—10⅞
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—106	105½
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	2—3	..
60.000	50	Feb. 26	13	12%	Portsea, Island B	128—131	92—97	..
100,000	50	,,	12	11%	Do. C	118—121	85—90	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	2—2⅛	40/—40,7½
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4⅜—5	2⅜—3⅛	£0/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	78—80	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	57¼—57½
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	61—67	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	7⅜—8½	..
125,000	50	July 1	5	5%	San Paulo 5 p.c. Deb.	47—49	42—44	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	178—182	..
209,984	,,	,,	10	10%	Do. B	223—224		
523 500	,,	,,	10	10%	Do. C	220—222		
90,000	10	May 28	9	6/-	South African	10½—11½	8½—9½*	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord.	111—113	77—79	77½—78½
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	73½—74½	56—58	..
224,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	140—142	..
952,795	,,	,,	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	76—78	76—77½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	77—79	..
135,000	—	—	—	48/4	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90	88½
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	76—78	..
120,000	,,	Feb. 12	7½	7⅛%	Tottenham A 5 p.c.	135—138	95—100	..
782,275	,,	,,	6	5⅝%	Tottenham District B 3½ p.c.	115—117	68—73	69½—70
181,255	,,	June 26	4	4%	Tottenham District 4 p.c. Deb.	87—89	63—65*	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109½	89—91	..
30,000	,,	Feb. 26	8⅜	80/-	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	114—119	..
255 636	,,	,,	6⅞	65/-	Do. B 3½ p.c.	129—134	99—101	..
108,075	,,	,,	5/17/8	56/-	Do. C 3½ p.c.	110—115	86—91	..
352,000	,,	,,	6⅛	58/9	Wimbledon 5 p.c.	117—122	88—93	..
98,000	,,	,,	6⅞	65/-	Epsom 5 p.c.	121—126	96—101	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66—69	51—54	..

* Ex. Div.

Stockport Gas Workers' Grievances.

A strike took place last week-end among the stokers and other workmen at the Stockport Corporation Gas-Works over the question of a bonus. Recently the claims of the men were submitted to arbitration; and the Arbitrator awarded a bonus ranging from 6s. to 12s. a week, according to the scale of pay. There were some points of difference as to the interpretation of the award between the management and the men, who went on strike because the award had not (they alleged) been carried out. The stokers demanded the full 12s., not including piecework and overtime. The carters and motormen employed in the gas-works had also given seven days' notice, claiming the recent Manchester award to this class of workmen. On behalf of the men, it was principally contended that they were entitled to a 48-hours week, whereas the management held that the rate was fixed on a 56-hours week. When the men (and a few women) came out on strike, it was pointed out to them by a member of the Gas Committee that if they remained at their work all the points of difference would be speedily settled. The Arbitrator had distinctly expressed his readiness and willingness to settle all points of dispute referred to him. As a result of this, the women resumed work on Saturday morning, and later in the day it was announced that, at a conference of the Gas Committee, attended by a representative of the Ministry of Munitions, it had been decided to refer the points in dispute to the Arbitrator—the men to return to work forthwith. This they agreed to do, and the short-lived strike ended. The gas supply had not, however, been exhausted; and it was expected that the week-end efforts of the Gas Engineer (Mr. S. Meunier) and his staff would result in the works in the district using gas for power purposes obtaining adequate supplies yesterday (Monday) morning.

Dublin Township Lighting.—At the meeting of the Pembroke (Dublin) Urban Council, correspondence was submitted with regard to an agreement on public lighting with the Alliance and Dublin Consumers' Gas Company. Mr. Forsyth explained that, with a initial outlay of £300, there would be a saving of £180 a year, and he believed the lighting system would be greatly improved. The Gas Company would take charge, and the Council would merely have to pay so much for each lamp—thus saving considerable labour. The Council accepted the Roads Committee's report on the subject; the agreement to be approved by the Gas Company.

The Walsall Corporation have given an order for a gas receptacle to be fitted to one of the motor buses, at a cost of about £20, for the purpose of experimenting as to the suitability of coal gas for running them in the event of a failure of the petrol supply.

After consultation with Lord French and the Commissioner of Police, the Home Secretary has informed the Deptford Borough Council that the lighting of one lamp in three may be dispensed with until Aug. 25, provided there is a lighted lamp for every 100 yards of street.

A communal kitchen has been opened in Ipswich, and promises to be a great success; the demand made by customers being already well in advance of ability to meet it. A photograph which has appeared in the local Press shows it to be a well-arranged kitchen, fitted up in the best style—that is, with a good array of gas-cookers and gas-boilers.

In view of the fact that the Government have issued instructions to, as far as possible, restrict the use of lead compounds to war purposes, the Torbay Paint Company are drawing special attention to their "Torbay" joint stopping. This is made from Torbay natural oxide of iron, and is an alternative for jointing to the red lead which is now unobtainable for the purpose.

With the intention of marketing them in conjunction with their own furnaces, Messrs. J. Lord, Ltd., have taken over full control of the "Omedwar" gas-stoves, which were first introduced by Brigade Surgeon Lieut.-Colonel Pringle, M.D., who protected them by a series of patents and registrations that, it is claimed, "represent the highest development in hygienic and economic gas heating and cooking."

In connection with the food economy campaign, there has been held in the Hornsey Gas Company's show-room, Muswell Hill, an exhibition of war-time cookery, with demonstrations by Miss Dobrée-Fox. Matters were fixed up by the Borough of Hornsey Local Committee for Food Economy and Control, by arrangement with the Hornsey Gas Company, who placed their organization at the disposal of the Committee.

The South Metropolitan Gas Company have written to the Camberwell Borough Council suggesting that, in view of the shortage of labour and the urgent need for economy in every possible direction, the usual painting of street-lamps this year should be dispensed with, so far as the columns are concerned. The Council agreed to the suggestion, providing that any saving effected in this way should be placed to the credit of the Council.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

MANAGER. Greenock Gas Undertaking. Applications by June 23.
ASSISTANT CHEMIST. No. 6318.
JUNIOR TECHNICAL ASSISTANT. Isle of Thanet Gas Company, Margate.
REPRESENTATIVES. No. 6316.
RETORT-HOUSE FOREMAN. No. 6319.
FOREMAN. Morecambe Gas-Works.
SULPHATE MAKER AND YARDMAN. Tiverton Gas-Works.
STOKER. Tiverton Gas-Works..
STOKER. Seaton Gas Company.

Plant, &c., for Sale.

PURIFIERS, SCRUBBERS, CONDENSERS, MOUTHPIECES, ASCENSION AND BRIDGE PIPES, HYDRAULIC MAINS, &c. Longwood Gas Offices.

Plant, &c., for Sale—*continued.*

STOKING MACHINES, &c. Keighley Gas Department.
AMMONIA SATURATOR. Koppers' Coke Oven and Bye-Product Company.
BOILER, CYLINDER, PIPES, AND FITTINGS, Tilley Bros., 53, Kingsland Road, E 2.
GASHOLDER (New). Clayton, Son, & Co, Ltd, Hunslet.

TENDERS FOR

Coal.

EAST RETFORD GAS COMMITTEE. Tenders by June 30.
HAVERHILL URBAN DISTRICT COUNCIL. Tenders by June 27.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by June 23.

Coal—*continued.*

LURGAN DISTRICT COUNCIL. Tenders by June 25.
SPENBOROUGH URBAN DISTRICT COUNCIL. Tenders by June 26.

Gasholder.

DUDLEY GAS LIGHT COMPANY. Tenders by July 1.

Tar and Liquor.

EAST RETFORD GAS COMMITTEE. Tenders by June 30.
SPENBOROUGH URBAN DISTRICT COUNCIL. Tenders by June 26.
WORKSOP GAS COMPANY. Tenders by June 25.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

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For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

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GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
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"VOLCANIC" FIRE CEMENT.
Resists 4,500° Fahr. Best for Gas-Works.
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REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
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SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—
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39, VICTORIA STREET, WESTMINSTER, S.W. 1.

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Tins for sale to Consumers.
In Bulk for Works Use.
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ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, ROSE MOUNT IRONWORKS, ELLAND.

SOUTH WALES TAR COMPANY, MARSYCWMMER, near CARDIFF.

TAR WANTED.—Best Prices paid either at fixed Rate or Profit-Sharing Basis.

BENZOL PLANTS FOR GAS-WORKS.

BAGLEY, MILLS, & Co., Ltd., 92, Victoria Street, Westminster, S.W., invite inquiries from all gas-works making 75 million cubic feet and upwards per annum.

See illustrated Advertisement Feb. 20, p. III. of Centre.

ALDER AND MACKAY, LTD. (ESTABLISHED 1850.)

WET AND DRY METERS, SLOT AND ORDINARY.

STREET LAMPS AND AUTOMATIC CONTROLLERS.

EDINBURGH.

TAR AND GAS LIQUOR WANTED IN LONDON DISTRICT.

THOMAS CLAYTON (Oldbury) Ltd., BRENTFORD, W.

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We Guarantee promptness with efficiency for Repairs.

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Telegrams—"HYDROCHLORIC, FEN, LONDON."

Telephone—1588 AVENUE (3 lines).

"FERROX." "FERROX." "FERROX."

A BRITISH Oxide Cheaper and Better than Bogore. 35 per cent. Water, 75 per cent. Ferric Hydrate. For Sale outright or on Loan.

OXIDE LIMITED, Brentford, MIDDLESEX.

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CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,

70, Chancery Lane, London.

Telegrams: "Patent London." 'Phone: 243 Holborn, And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.

See Illustrated Advertisement, May 15, p. 268.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

AN Assistant Chemist wanted. Com- petent to Make the Tests usual in a Gas-Works. Excellent opportunity for suitable man.

Apply by letter, to No. 6318, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

STOKER Wanted. Must be Good Shovel Charger, Used to Engines and Exhausters and the Usual Routine Work. None but Sober, Steady Men need apply. Good Constant Job.

For full Particulars, apply to the MANAGER, Gas-Works, Tiverton, DEVON.

SULPHATE Maker and Yardman re- quired, able to Assist at Stoking when necessary. Good Money offered to a Useful, Willing Man.

Apply to the MANAGER, Gas-Works, Tiverton, DEVON.

WANTED—Three First-Class Re- PRESENTATIVES, on Commission, working the Midlands, North of England, and Scotland, for Furnaces, Stoves, and Gas Apparatus.

Apply, by letter, to No. 6316, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

THE Seaton Gas and Coke Company, Devon, require a Good, Steady STOKER, Wages 35s. per Week. Comfortable job for Suitable Man.

Apply to A. R. WYATT, Manager.

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FOREMAN wanted.—Salary about £130, according to Qualifications.

Apply R. H. RUTHVEN, Engineer, Gas-Works, MORECAMBE.

RETORT HOUSE FOREMAN required by a Gas-Works in the South of England producing over 800,000,000 C.Ft. per Annum. A good wage will be paid; but only those who are Thoroughly Experienced in Retort-House Work and whose services can be spared from their present Employment, need apply.

Applications, stating Age and Experience, to be sent as soon as possible to No. 6319, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

CORPORATION OF GREENOCK.

WANTED—for the Gas Undertaking of the Corporation of Greenock a GAS MANAGER, who will require to give his Whole Time and Attention to the Duties of the Appointment. A Good House is Provided, Rent Free.

Applications, marked "Gas Manager," stating Age, Experience, Salary expected, and accompanied by Testimonials, must be lodged not later than the 23rd inst. with the Subscriber, from whom Particulars as to Duties may be obtained.

ANDREW NIMMO, Town Clerk.

Municipal Buildings, Greenock, June 13, 1917.

ISLE OF THANET GAS LIGHT AND COKE COMPANY, MARGATE.

JUNIOR Technical Assistant required having a fair knowledge of Laboratory Work, Drawing, and General Gas-Works Routine. Discharged Soldier, or otherwise Ineligible Man, preferred. Excellent opportunity afforded for Technical Improvement.

Applications, stating Age, Experience, and Salary required, to be sent without delay to the undersigned.

J. M. CAMPBELL, Engineer and General Manager.

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Further Particulars on Application to the KOPPERS COKE OVEN AND BYE-PRODUCT COMPANY, 301, Glossop Road, SHEFFIELD.

GAS PLANT for Sale.—We can always offer New and Second-Hand Gas Apparatus, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND CO., LTD., CHURCH FENTON, near LEEDS.

TOWER SCRUBBER, 6 ft. diam. by 35 ft. high, Modern in every respect, fitted with Automatic Water Tippler and Spreading Arrangement, Livesey Boards, 10 in. Valves and Connections. Complete on Rails and marked. £200 prompt Cash buys.

Address No. 6314, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

THE Keighley Corporation Gas Com- mittee have FOR SALE a Set of DE BROUWER (1908) STOKING MACHINES, together with COAL BREAKER, ELEVATOR, and 25 Tons COAL STORAGE HOPPER.

Full Particulars may be obtained from the undersigned.

W. BAILLIE, Engineer and Manager.

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FOR SALE.—One Dome Top BOILER 3 ft. 6 in. × 1 ft. 6 in. ⅝ in. Plate.

One Dome Top BOILER 4 ft. × 1 ft. 9 in. ⅜ in. Plate.

Two CYLINDERS 5 ft. 6 in. × 1 ft. 9 in. ½ in. Plate, Galvanized.

One CYLINDER 4 ft. × 2 ft. ½ in. Plate, Galvanized.

A Quantity of 3-in. and 4-in. C. I. WATER MAINS and FITTINGS.

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Apply, TILLEY BROS., 53, KINGSLAND ROAD, E. 2.

TANKS and Receivers for Sale.— Among others, we have the following:—

FLAT-END BOILER TANKS: 8 ft. × 30 ft., 8 ft. × 24 ft., 7 ft. 6 in. × 28 ft., 7 ft. × 24 ft., 7 ft. × 30 ft., 6 ft. × 16 ft.

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AIR RECEIVERS: 3 ft. 6 in. × 18 ft., and 3 ft. 6 in. × 26 ft. 6 in., to stand a pressure of 150 lbs.

Low Prices accepted to save removal. Guaranteed Satisfactory.

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NEW Two-Lift Spiral-Guided Gas- HOLDER with STEEL TANK ready for immediate Sale and Erection.

Capacity, approximately 400,000 c.ft.

Tank, 110 ft. × 23 ft. deep.

Pressure, Inner Lift 57/10.

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GAS PLANT FOR SALE.

OWING to the closing-down of the Slaithwaite Works, the Longwood and Slaithwaite Gas Company have the following GAS PLANT FOR SALE:—

Four PURIFIERS, 15 feet square by 4 feet deep, with Centre Valve, Lifting Gear, and Connections complete.

Two Wrought-Iron SCRUBBERS, 25 feet by 5 feet, with Machinery Room at top 12 feet high.

Six Annular CONDENSERS, 18 feet high, inner Column 1 foot 10 inches, outer Column 2 feet 6 inches, with Syphons, Connections, and Bye-Pass complete.

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6-inch ASCENSION and BRIDGE PIPES, HYDRAULIC MAINS, &c.

Inspection invited.

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BOROUGH OF EAST RETFORD.

THE Gas Committee of the above Corporation are open to receive TENDERS for the Supply of 8000 Tons of GAS COAL or NUTS during the ensuing Twelve Months. Tenders to be sent in on or before the 30th inst., addressed to the Chairman of the Gas Committee, endorsed "Tender for Coal."

No Forms of Tender issued.

J. B. FENWICK, Engineer and Manager.

BOROUGH OF EAST RETFORD.

THE Gas Committee of the above Corporation are open to receive OFFERS for the Purchase of the TAR and AMMONIACAL LIQUOR produced at their works during the next Twelve Months.

Particulars may be had from the undersigned.

Tenders to be sent in on or before the 30th inst., endorsed "Tender for Tar" or "Liquor."

J. B. FENWICK, Engineer and Manager.

WORKSOP GAS COMPANY.

THE Directors of the Worksop Gas Company invite TENDERS for the Purchase of AMMONIACAL LIQUOR made at their Works during the Six Months commencing July 1, 1917.

Tenders to state price per Ton as tested by No. 1 Twaddel Hydrometer, Delivered into Boats near the Company's works, or Price per Ton Delivered into Purchasers' Tanks at the Railway Station.

The Directors do not bind themselves to accept the highest or any Tender.

Tenders to be sent to the undersigned not later than Monday, June 25, 1917.

FRANK LUKE, Secretary.

Gas Offices, Worksop. June 13, 1917.

H. MITCHELL, FOR PATENT SLOT METER PAD & OTHER LOCKS. KENTISH TOWN, N.W. J. R. & J. DEMPSTER, LTD., 84 & 2200 Manchester.